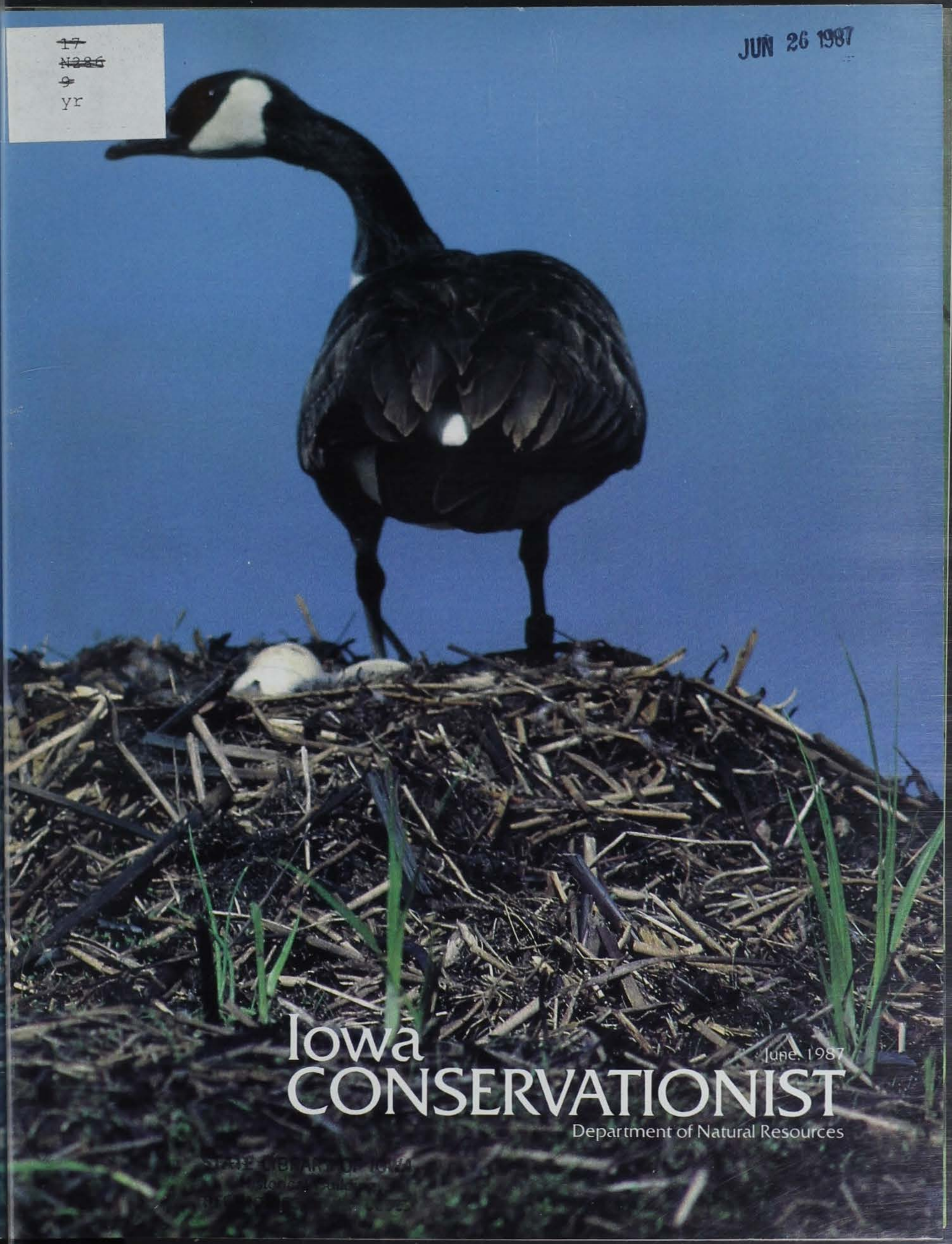

Iowa CONSERVATIONIST

June 1987

Department of Natural Resources

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JUNE 1987

Iowa CONSERVATIONIST

DEPARTMENT OF NATURAL RESOURCES

COVER: A pair of Canada geese defend their nest. Photo by Lowell Washburn.

SPECIAL PHONE NUMBERS
DNR Central Office
1-515/281-5145
Turn In Poachers (TIP)
1-800/532-2020
Emergency Spill Response
1-515/281-8694
Energy Hotline
1-800/532-1114 or
in Des Moines, 281-7017

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TAKE PRIDE IN AMERICA... TAKE PRIDE IN IOWA... BETTER YET, TAKE PRIDE IN IOWA OUTDOORS

By Ross Harrison

From now until next June, Iowans are in for an inspirational experience. We are due and it is owed us.

Taking a spin off the national campaign, Take Pride in America, some Iowa government leaders and the Iowa Newspaper Association joined hands last month deciding that Iowa needed a grassroots effort to point out the positive and generate some new, good feelings of what Iowa is all about. There aren't any partisan politics in this campaign, just a lot of desire to awaken in some and bolster in others the feeling of pride in our great state.

Because Department of Natural Resources Director Larry Wilson had a big hand in formulating the Take Pride concept, and because there is much to be proud of in outdoor Iowa, the DNR was given the lead for the first two months, June and July, of Take Pride in Iowa. In following months, other state agencies and organizations will focus on other important Iowa features. Through special events and promotional activities, it is hoped that some positive spirits will be kindled in the coming year.

Outdoor Pride

Through the years, there has been a lot of talk among outdoor enthusiasts about a conservation ethic. That word "conservation," meaning wise use, covers the gamut of interests in the out-of-doors from active recreation by sportsmen to passive appreciation by observers, and everything in between. If we all held enough pride in our natural resources, that ethic would prevent us from spoiling our countryside with litter, fouling our waters with soil and chemicals, vandalizing public facilities, losing or abusing our preciously few natural areas and wildlife habitats.

TAKE PRIDE IN IOWA OUTDOORS

Nestled among the nation's richest agricultural lands are forest, park and natural areas that are just as rich for outdoor recreation, relaxation and inspiration. Take pride in Iowa's Outdoors during the months of June and July and **Take Pride in Iowa!**

Pride comes from a deep appreciation of the positive. While there is considerable room for improvement in Iowa's outdoor resources, we have enough positive features to give us the pride we need to demand that improvement. Consider just a few of the facts:

— Fewer than 50 years ago, you could almost count the number of deer and wild turkey in Iowa on one hand; today, populations are high enough to support harvest by hunters of more than 60,000 deer and nearly 6,000 turkeys.

— Gone from the state since about the turn of the century, one of nature's most endearing creatures, the river otter, is making a comeback from successful stockings in numerous areas.

— Iowa's 72 state park and recreation areas annually support more than ten million visitors.

— The county conservation board system in Iowa is indisputably the national leader in terms of grassroots involvement, programs and budgets in the conservation field; 98 of 99 counties have a county conservation board.

— The national Fund for Renewable Energy and the Environment this year ranked Iowa eighth out of 50 states for state government environmental programs.

In the coming weeks, we will be featuring many more positive facts about Iowa's outdoors through some exciting events and activities. Plan to take part in Take Pride in Iowa Outdoors programs in your area. There is much we can all learn, and some values we should improve upon.

The week of June 14-20 is State Park Week in Iowa. Nearly all state parks will feature special events, special deals and special fun. Governor Branstad, quite an outdoor enthusiast, will participate in the June 6 Governor's canoe float with state conservation leaders, legislators and landowners along a scenic stretch of the Boone River in Hamilton County, helping to recognize June as River's Month in Iowa. Later in the summer, the Governor will also attend several state park "spruce-up" days to work with local volunteers taking pride in the appearance of their nearby state parks.

A new activity, destined to attract a lot of interest is the Iowa Outdoor Beauty Contest. Most county conservation boards will announce rules in your county for the selection of "the one, most beautiful spot in each county." These sites will be featured in a photographic display in the Natural Resources Building during the state fair in August, plus appearing on TV news programs, in the *Iowa Conservationist* and other areas as well. Look for local information so that you can participate in this competition and other events in your area. And, Take Pride in Iowa Outdoors.

Take Pride In Iowa

June-July — Outdoors
August — Communities
September — Labor and Industry
October — Culture and Heritage
November — Education
December — Families

1988

January — Children
February — Elderly
March — Health and Safety
April — Transportation
May — Law Enforcement
June — Agriculture

Project Aids in Satisfying the Canvasback's Gourmet Tastes

By Lowell Washburn,

During a two-week period in April, personnel from the Iowa Department of Natural Resources had the opportunity to join forces with conservationists from the private sector in a rather unique effort designed to aid in the restoration of declining populations of canvasback ducks.

According to Jim Hansen, state waterfowl biologist, the project involved the help of over 100 wildlife enthusiasts who aided the DNR in planting around 30,000 wild celery buds in seven public areas located in five north-central Iowa counties. Participating volunteers consisted largely of members from Ducks Unlimited, local rod and gun clubs, and the Boy Scouts.

For those not familiar with wild celery, the species does not even remotely resemble the stuff found at

Lowell Washburn

your local produce counter. Instead, it is an aquatic plant that grows beneath the water's surface, producing ribbon-like leaves and starchy, high-energy tuberous root systems. It is mostly foods such as these roots that canvasback ducks depend upon for survival.

Canvasbacks have an interesting, though often tragic association with man. Classed among the diving ducks, they were once one of the most common American waterfowl, easily numbering into the millions of birds. As recently as the mid-1970s, over 700,000 "cans" still returned to the traditional breeding grounds located mainly along the prairie pothole region of southern Canada. By the spring of 1985, the breeding population had deteriorated to the point that only about 400,000 canvasbacks were inventoried. Consequently, there has been a moratorium on the hunting of canvasback ducks since 1985.

The causes for the canvasback's demise are varied and complex. Certainly, many of the bird's woes can be directly attributed to the drainage of critical wetland habitats in Canada. Nest-destroying raccoons are also staging an apparently successful invasion of the northern prairies. In addition, many of the canvasback's eastern seaboard wintering grounds have been miserably degraded.

Recently, scientists have begun to suspect that canvasback declines may also be linked to the disappearance of Midwestern wild celery beds. In order to complete the annual round trip journey from the Canadian breeding grounds to the East Coast wintering areas, migrating "cans" must be able to locate quantities of high energy forage. Wild celery provides that caliber of forage, often containing even more usable calories than most domestic crop grains. But as various sources of pollution cause the elimination of celery beds from many traditional areas, migrating ducks have to move increasingly greater distances in order to replace spent calories. Although the problem is currently being studied by the U.S. Fish and Wildlife Service, no one can yet say with certainty what impact the celery decline is having on canvasback numbers.

However, there is one point upon which all agree. Where there is wild celery, there are canvasback ducks. Unfortunately, much of the Midwest's current supply of the plant is found growing along a relatively small portion of the Upper Mississippi River. During periods of migration, up to one-third of all canvasbacks may congregate there to feed. That, say biologists, could spell disaster.

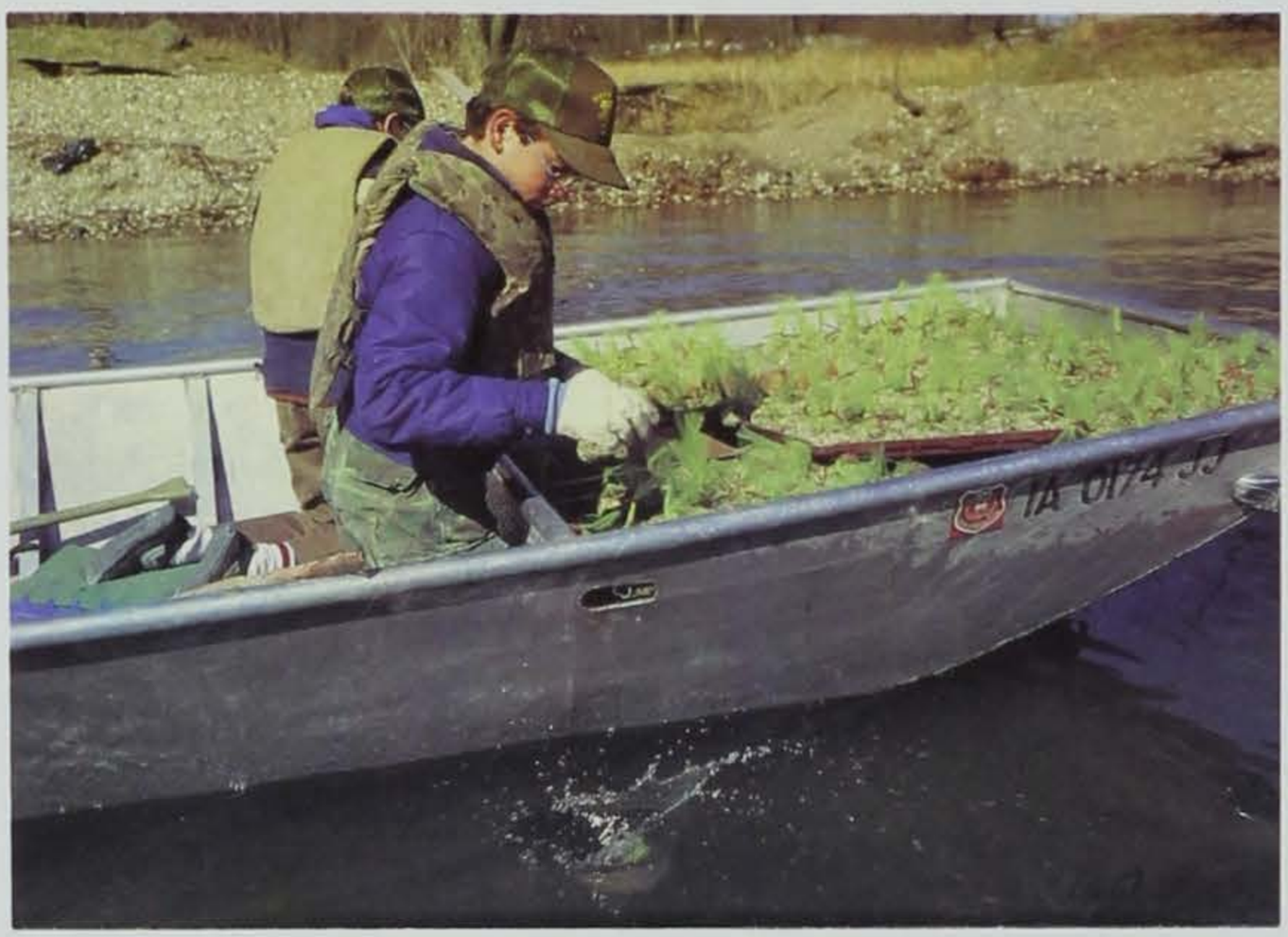
"Our greatest fear isn't what is happening, but what could happen," said Hansen. "Should some environmental catastrophe such as an oil or chemical spill occur, it could not only mean the direct loss of thousands of birds, but could also result in the destruction of hundreds of acres of food as well," he explained. In the early 1960s, such a spill did kill some 10,000 waterfowl.

Lowell Washburn

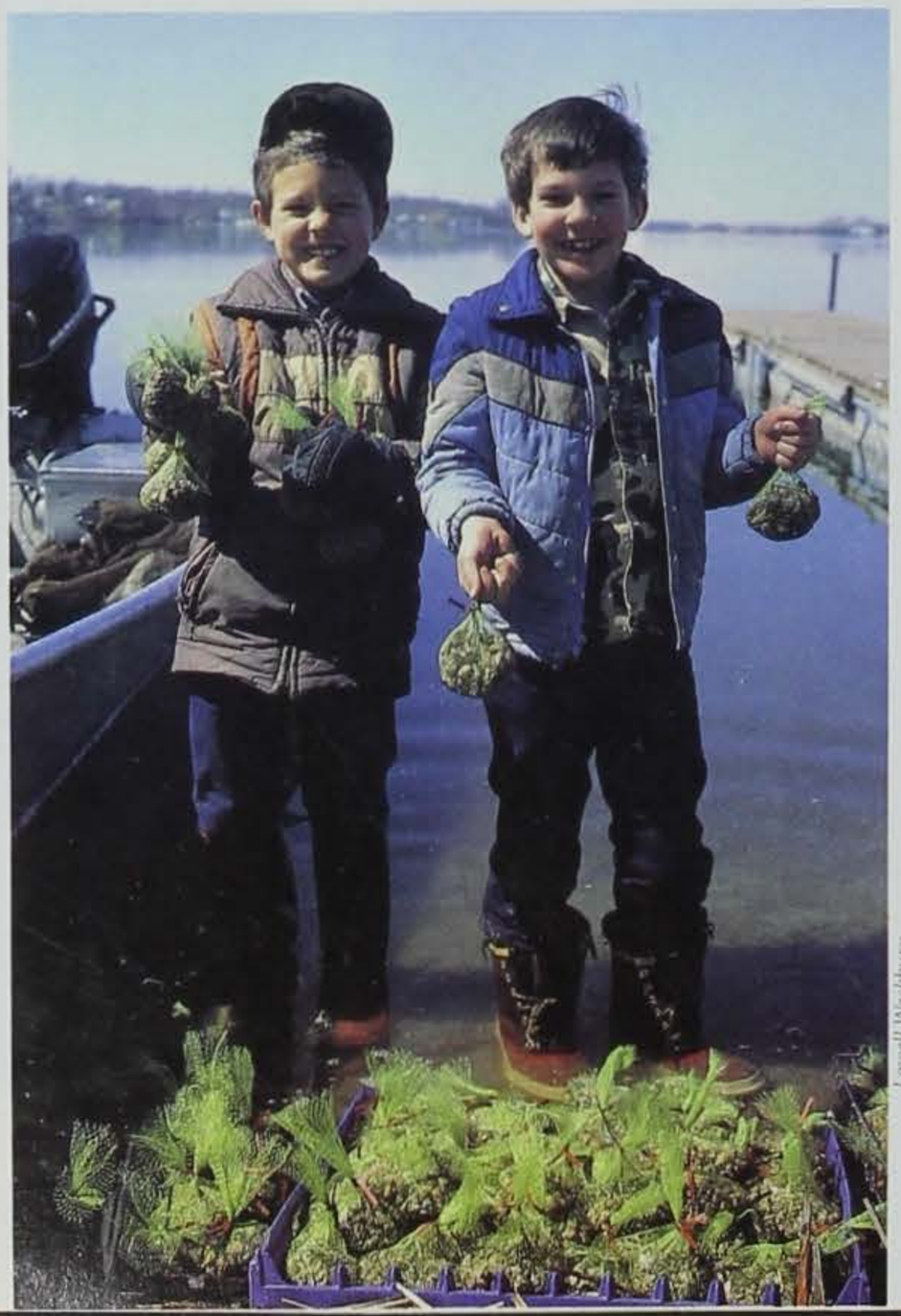
Lowell Washburn

Wild celery tubers* (above)*, a favorite food of the canvasback, were placed in mesh bags, along with gravel, and planted in seven public wetland areas. Volunteers from the five-county area made the planting project run smoothly.

To address this ongoing threat, the U.S. Fish and Wildlife Service has recently launched a project designed to help restore canvasback numbers by making the bird's food more abundant. At the Upper Mississippi River National Wildlife and Fish refuge located at LaCrosse, Wisconsin, the FWS is making use of a hydraulic dredge to harvest thousands of celery tubers. Those buds are then distributed, free of charge, to participating Midwestern states along known migration routes. Once the tubers reach their destination, the celery is planted by placing two or three individual roots into mesh grape bags which have been partially filled with gravel. Those bundles are then tossed from boats into two to six feet of water. Under ideal growing conditions, one tuber will become twenty by autumn.



Lowell Washburn



Lowell Washburn

Bags of celery tubers were dropped from boats. Under ideal conditions, one tuber will become 20 by this fall. Wild celery is a submergent plant and is recognized as a valuable nursery and cover plant for a variety of fish species as well as food for canvasbacks and other waterfowl. Hopefully, this planting project will allow these youthful volunteers **(right)** *to enjoy canvasbacks in north-central Iowa.*

According to Hansen, thousands of canvasbacks already pass through Iowa during spring and fall migration. But due to the lack of suitable food, few bother to linger on the state's wetlands. "Hopefully, this spring's celery transplant will change all of that," he said.

Should the venture prove successful here and elsewhere along the migratory trail, it could benefit the canvasback in a variety of ways. First of all, it will hopefully aid in dispersing the birds from dangerously high concentrations on the Mississippi River. It could also potentially reduce the stress of migration, allowing ducks to arrive on both the wintering and breeding areas in better physical condition. This could be especially important during northward spring movements when female "cans" need to pile on nutrient reserves for the nesting effort.

Canvasback ducks, however, are not the only wildlife species likely to benefit from Iowa's wild celery transplants. The plant is also favored by swans, wigeon, redheads, scaup and ring-necked ducks. Also, the presence of celery in fishing areas, such as Clear Lake or Crystal Lake, could play a role in enhancing the entire aquatic ecosystem. This submergent plant is widely recognized as a valuable nursery and cover plant for a wide range of fish species. It also supports a variety of invertebrate life, such as snails and insects, that are used by growing fish.

During the remainder of the summer, the DNR will closely monitor this year's transplants to determine which areas are most suited to the production of wild celery. During the 1988 season, wildlife personnel hope to expand the restoration effort to additional wetland areas.

Lowell Washburn is an information specialist located at Clear Lake. He has been with the department since 1984.

Lowell Washburn

KING OF DUCKS

By Lowell Washburn

"We offer no apology for thus elevating the lordly Canvasback to a classical role, for among duck-minded people he has long been the "gold standard" against which all lesser fry are weighed and measured."

Aldo Leopold

Swift of wing and unique in profile, the magnificent wedge-shaped canvasback is hard to mistake for any other duck. The drake's distinctive white back, chestnut head, and blood-red eye make it one of the world's most handsome waterfowl.

It is also one of the largest and best tasting of American gamebirds. The early settlers were quick to pick up on the fact that the bird's habit of feeding on the tender roots of wild celery gave it an unrivaled flavor. The canvasback's fame spread quickly, and it was soon the most sought-after duck in the new world. In fact, the bird provided the very foundation for an era when men drew their living by gunning for the market.

Perhaps nowhere on earth was the practice of market gunning carried to such extremes as on the Chesapeake Bay. The mighty Chesapeake was the traditional winter retreat of the canvasback, and the greatest concentrations were to be found upon the Bay's northern reaches. Here, the sprawling Susquehanna Flats encompassed a hundred square miles of shallow, open water than sprouted wild celery and canvasback ducks in mind-boggling profusion.

Commercial gunners operating on the flats would most often anchor themselves offshore in layout batteries surrounded by 500 or 600 handmade decoys. When the morning's shooting began, the disturbed flocks were said to resemble plumes of smoke rising from the Bay. On a good day, a single gunner could literally take more ducks than many modern-day hunters will bag in a lifetime.

The succulent, celery-fed canvasback soon rose to the very pinnacle of fine dining, and in the marketplace easily commanded more than twice the price of lesser fowl. Consequently, it is little wonder that the professional hunters soon began to refer to the species as the "King of Ducks." In the eastern cultural hubs such as Baltimore or Philadelphia, no self-respecting politician or other dignitary would dare stage a dinner party without featuring roast canvasback duck and terrapin stew on the menu. In addition to commercial interests, the fast-flying "cans" also began to draw a good deal of interest from those who hunted ducks for pleasure rather than profit. Listed among the most ardent canvasback enthusiasts were Presidents Ulysses S. Grant and Grover Cleveland.

To put this picture into its proper perspective, it must be remembered that at this point in time the canvasback duck was among the most abundant of waterfowl and was indeed considered limitless. Unfortunately, the folly of this logic had become painfully evident by the turn of the century. The "can," along with other waterfowl, was showing alarming rates of decline. Within a few short years, the market gunner had been legislated out of existence.

Under systems of modern game management, many species such as the wood duck and Canada goose have staged remarkable recoveries. Unfortunately, the regal canvasback has not. Today, it is among the most uncommon of waterfowl.

Although the early market gunners may have exacted a heavy toll, their combined impact was miniscule compared to the havoc currently being wrought by the wholesale drainage of prairie nesting habitats and degradation of wintering areas. Sadly, it seems that perhaps more than any other wild duck, the canvasback is unable to cope with change within its fragile world. Exactly what the future holds for this intriguing species is still anybody's guess.

Once there were millions, today there are thousands. But the migrating flocks are still as thrilling as ever to behold. Although the canvasback does seem a bit tattered around the edges these days, to some of us he is still the King of Ducks.

Delaware County

Delaware County Conservation Board

Delaware County Brings Nature Indoors

By Betsy Paragamian

Several giant Canada geese fly overhead, sounding their signal that autumn is near. A raccoon lifts a freshwater mussel out of the water, while a hungry mink eyes its next meal — a sassy muskrat. A typical scene at the marsh? Yes, but this scene is unfolding in Delaware County's new nature center. The center has a variety of displays, many of which allow the visitor's imagination to take control.

The nature center is located in the Delaware County Conservation Board's headquarters building at the 80-acre Bailey's Ford Park outside Manchester. The 80- by 124-foot structure also contains a machine storage area, a maintenance work area, kitchen, two offices and a lobby.

In the nature center, a bird nest collection shows the various sizes and designs used by birds to build their homes. A small goldfinch nest is lined with thistle down and other soft plant fibers, while a house sparrow's sloppily-built nest is lined with chicken feathers.

Nearby, a touch table contains animal skulls, pine cones, deer antlers, snake skins, a stuffed owl, fossilized rocks, bird nests and many other natural objects. Visitors have the opportunity to handle and examine these items, as well as animal pelts on another table. The pelts are labeled "Please Touch!" to give visitors a chance to compare the textures of furs from beaver, muskrat, squirrel, red fox, coyote, raccoon and others.

Dispiayed on the walls of the center are pelts of the timber wolf, American bison and black bear — animals which were once native to the area, but have long since disappeared from the Iowa landscape. An exhibit of animal pelts from Africa and Asia is also displayed and includes pelts of a jackal, African civet, duiker, waterbuck, eland, sable antelope and fallow deer.

An "outdoors" feeling is recreated inside the center through two habitat displays — a woodlands scene and a wetlands scene — containing preserved specimens posed as they would appear in the wild. In the woodlands habitat, a raccoon hangs on the trunk of a tree, while a gray fox stalks a cottontail rabbit. Two ruffed grouse prepare for flight, and a fox squirrel holds an acorn. Two turkeys strut through the leaves, as a timber rattlesnake suns itself on a rock. Many other birds, mammals and insects complete the scene.

The wetlands habitat, mentioned earlier, also features a great blue heron reaching for a water snake, a beaver chewing on a tree trunk, and other marsh birds, insects and snakes.

The living displays, including many species of snakes, turtles, fish and salamanders native to northeast Iowa, are housed in large aquariums that are set into one wall of the nature room. Visitors to the center enjoy watching and even holding these interesting creatures.

The nature center is still growing. The upstairs loft will be the site of an insect display and a working bee hive, as well as rocks and fossil collections and plants and soils displays. Outside, the bird sanctuary and the nature trails started by the Delhi Boy Scouts will be developed further. Trails will eventually lead to the marsh, the trout stream and woods, and the prairie area.

Support for the nature center has been outstanding. School and scout groups, community clubs, businesses and even families and individuals have contributed time, money and materials to furnish the nature center. When money is donated for a certain item, the sponsoring group is given an "adoption certificate" with a photograph of the "adopted" preserved animal they have chosen.

From visiting to lending a hand, the Delaware County community is making *their* nature center a special place to visit. And you're invited!

Betsy Paragamian has been a naturalist with the Delaware County Conservation Board since 1977. Betsy is a graduate of Towson University near Baltimore, Maryland with a degree in science education.

CALENDAR

June 9	Amphibious Concert 7:00 p.m.	Heritage Slough Wright County 532-3185
June 12	Owl Lookout 7:00 p.m.	Rodger's Park Benton County 472-4942
June 12	Full Moon Walk 8:30 p.m. to 9:30 p.m.	Pollmiller Park Lee County 319/463-7673
June 12, 19, 26 July 10, 17	Nature Programs 8:45 p.m.	Pioneer Park Page County 712/542-3864
June 13	Art Alive! Hoe Down	Wright/Clarion Lake Cornelia Park 532-3185
June 13	Full Moon Swamp Tromp 9:00 p.m.	Larson Marsh Story County 515/232-2516
June 13	Plant Identification Hike 3:00 p.m.	Echo Valley State Park Fayette County 319/425-3613
June 13	Animal Adaptation 8:00 p.m.	Gouldsburg Park Fayette County 319/425-3613
June 13	Bike Ride	Pollmiller Park Lee County 319/463-7673
June 13	River Fishing Float Contest 7:00 a.m.	Eldon 515/652-3297
June 13, 14	BACCI — Bicycle Around Carroll County, Iowa	Carroll Chamber of Commerce 712/792-4383
June 13-14	Buckskinners' Rendezvous	Big Creek State Park Polk City 515/984-6473
June 13-14, 20-21	Bass Tournament	Honey Creek State Park Moravia 515/724-3739
June 13, 20, 27	Junior Naturalist Program (Ages 9 to 12) Saturday Mornings	Swan Lake State Park Carroll County 712/792-4614
June 14	Kid's Films	Lake Meyer Nature Center Winneshiek County 319/534-7145
June 14	"Float With The Pros" Canoe Float	Canton Canoe Access Jackson County 319/652-3783
June 14	Float With The Pros 10:00 a.m. to 3:00 p.m.	Jackson County 319/652-3783
June 14-20	State Park Week Look for special events in state parks throughout Iowa.	
June 16	Bike Ride 7:00 to 8:30 p.m.	Cedar Valley Nature Trail Black Hawk County 319/277-2187
June 18	Prairie Walk 7:00 p.m.	Ames High School Prairie Story County 515/232-2516
June 19	Friday Night At The Movies	Wright/Clarion Lake Cornelia Park 532-3185
June 19	Craft Fair 10:00 a.m.	Black Hawk State Park Lake View 712/657-8712
June 19	Local Band Presentation	George Wyth State Park Cedar Falls 319/232-5505
June 19-21	Viking Lake Festival	Viking Lake State Park Stanton 712/829-2235
June 20	Easter Lake Fun Day Children $.60, Adults $1.25	Easter Lake Polk County 515/243-9647
June 20	Open Forum with Game Warden 8:00 p.m.	Gouldsburg Park Fayette County 319/425-3613
June 20	Boating Safety	Pine Lake State Park Eldora 515/858-5832
June 20	Camping, Displays, Prizes	Ledges State Park Boone 515/432-1852
June 20	Ballooning Demonstration	George Wyth State Park Cedar Falls 319/232-5505
June 20	Bike Ride 4:00 to 6:00 p.m.	Cedar Valley Nature Trail McFarlane Park Black Hawk County 319/342-2787
June 20	Canoeing and Astronomy Programs	Hickory Hills Park Black Hawk County 319/277-2187
June 20	Fishing Seminar 10:00 a.m. Camp Olympics 1:00 p.m. Crawdad Cookout 7:00 p.m.	Black Hawk State Park Lakeview 712/657-8712
June 20-21	Archery Shoot 8:00 a.m. to noon	Hickory Hills Park Black Hawk County 319/296-1795
June 21	Wild Call For Help (rehabilitating injured wildlife) 2:00 p.m.	Story County 515/232-2516
June 21	Canoeing Techniques	Lake Meyer Nature Center Winneshiek County 319/534-7145
June 21	Father's Day Bird Hike 7:00 a.m.	Gouldsburg Park Fayette County 319/425-3613
June 21	Volksmarch 10:00 a.m. to 2:00 p.m.	Black Hawk County 319/277-2187
June 21	Bike Ride with a Ranger 4:00 to 6:00 p.m.	McFarlane Park Black Hawk County 319/342-2787
June 22-26	Bio-Pioneers Day Camp Free Kids' Day Camp Grades 3-6	Fontana Park, Hazelton Buchanan County 319/636-2617
June 24	Canoeing the Cedar River 1:00 to 5:00 p.m.	Black Hawk County 319/277-2187
June 24	Canoe Trip on Cedar River 1:00 to 5:00 p.m.	Hartman Reserve Nature Center Black Hawk County 319/277-2187
June 27	Tree Identification Hike 10:00 a.m.	Echo Valley State Park Fayette County 319/425-3613
June 27	Water Safety Talk 10:00 a.m. to noon	Little Wall Lake Hamilton County 515/832-1994
June 27	Skunk River Canoe Trip 10:00 a.m. to 4:00 p.m.	Skunk River Story County 515/232-2516
June 27	Turkey Foot Canoe Race (registration required)	Cedar River Black Hawk County 319/277-2187
June 27	Iowa River Canoe Float Trip	Marshall County 515/752-3150
June 27	Star Party/The Ringed Planet (A Look At Saturn) 9:30 p.m.	McFarland Park Ames 515/232-2516
June 27	Bird Watchers' Hike 8:30 a.m.	Jester Park Polk County 515/999-2559
June 27	Turkeyfoot Canoe Race, Cedar River 9:00 a.m. to noon	Hartman Reserve Nature Center Black Hawk County 319/277-2187
June 27-28	Galland School Days Experience a School Day in the 1800s	Galland School Lee County 319/463-7673
June 28	North Raccoon Canoe Float	Carroll County 712/792-4614
June 28	Water Critters	Lake Meyer Nature Center Winneshiek County 319/534-7145
June 28	Tenth Annual Briggs Woods Open Amateur Tournament, $15	Briggs Woods Golf Course Hamilton County 515/832-1994
July-August	Saturdays Environmental Programs 2:00 p.m. Movies at Dusk	Swan Lake State Park Carroll County 712/792-4614
July-August	Galland School Days Sundays	Galland School Lee County 319/463-7673
July 1	Prairie Seasons Walk 7:00 to 8:00 p.m.	Marshall County Prairie Creek Grassland 515/752-3150
July 3	Campground Fun and Games 10:00 a.m. and 1:00 p.m.	Jackson County 319/652-3783
July 10	Beavers of Cedar Rapids 7:30 p.m.	Indian Creek Nature Center Cedar Rapids 319/362-0664
July 11	Bike Ride Around Warren County 25-, 50-, and 100-mile loops 7:00 a.m.	Indianola 515/961-6169
July 11	Blisters and Breakfast Hike 7:00 a.m.	Indian Creek Nature Center Cedar Rapids 319/362-0664
July 11	Searching for Bluebirds 10:00 a.m.	Indian Creek Nature Center Cedar Rapids 319/362-0664
July 11	Life Cycling 8:30 a.m. to 3:30 p.m.	Wright and Hamilton Counties 515/532-3185
July 11	Great Raccoon River Float	Carroll County 712/792-5600
July 11	Canoe Safety Instruction 1:00 to 3:00 p.m.	Palo Alto County 712/837-4866
July 11-18	MADRAC Mississippi River Canoe Adventure	Burlington 319/753-5107
July 12	Wildflower Hike 2:00 p.m.	Five Ridge Prairie Preserve Plymouth County 712/947-4270
July 12	Art Alive 1:00 to 5:00 p.m.	Lake Cornelia Park Wright County 515/532-3185
July 15	Snakes for Lunch 12:15 p.m.	Greene Square Park Cedar Rapids 319/362-0664
July 15	Prairie Work Week	Marshall County 515/752-3150
July 18	Sing Along 7:00 and 9:00 p.m.	

June

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July

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Education Makes Recreation Safe

By J. Sonny Satre and Don Sievers

The Iowa Department of Natural Resources Law Enforcement Bureau offers four recreational safety education courses to the state's outdoor enthusiasts. The instructional courses cover hunter education, boating safety, snowmobile/ATV safety and a new course in fur harvesting.

Let's discuss each one individually and explain what the course is all about and why the course is offered.

Hunter Education

This is a ten-hour course that is required of anyone born after January 1, 1967 before he or she can purchase an Iowa hunting license. This program became mandatory July 1, 1983. Prior to that, the course had been offered on a voluntary basis since 1960. Since that time, over 250,000 students have been trained. In the past few years, the average number of students has been approximately 10,000 annually. The minimum age for taking the course is twelve years. The hunter education course is designed to provide basic training in all phases of hunting such as firearm safety/safe gun handling, hunter ethics and responsibilities, wildlife management, bow hunting basics, black powder/muzzleloader basics, familiarization of Iowa hunting and wildlife laws, survival, first-aid, wildlife identification, and last but not least — proper care of game after it is harvested. Although not mandatory, we encourage our instructors to offer a live shooting experience to the students with either a shotgun or rifle. In 1986, 53 percent of the students had the opportunity to fire a gun as part of the classroom activity. Students must also demonstrate their abilities in various firearm handling exercises and take a final exam to successfully complete the course.

The course is taught by DNR certified volunteer instructors who come from various backgrounds. School teachers, sportsmen groups, dedicated hunters, conservationists and many civic-minded organizations are represented.

Instructors are trained by DNR recreation safety officers and conservation officers. The course, for which there is no fee charged to the student, is offered year-round with most of the demand occurring from late August through November. The purpose of the hunter education program is to reduce hunting accidents and to produce responsible, ethical and knowledgeable hunters in the field. Nonhunters are encouraged to attend these classes so they become familiar with firearms in that many needless accidents occur in the home.

The hunter education program is producing safer hunters and gun handlers. In 1966, Iowa recorded 140 firearm accidents which resulted in 19 fatalities. In 1986, there were only 42 accidents reported and two fatalities. This is a 70 percent decrease in firearm accidents. In 1985, Iowa recorded only 37 accidents which is the lowest since records have been maintained.

Seventy-five percent of the costs associated with the hunter education program comes from the Federal Aid in Wildlife Restoration Act (also known as the Pittman-Robertson Act) which became law in 1937. Money for the Pittman-Robertson program comes from an 11 percent federal excise tax on sporting firearms, ammunition and archery equipment, and a 10 percent excise tax on handguns. Hunter safety education funds are derived from one-half of the excise taxes collected on handguns and archery equipment and are apportioned to states according to population.

Boating Education

The DNR offers three different types of boating courses which are all voluntary and are cost-free. The most popular of the boating courses is a home study course. This type of "correspondence" course can be studied and completed at your own pace. In 1986, over 500 people took this course. It is designed for ages twelve and older. Those who successfully complete the course receive a certificate and safe boating patch from the DNR. Successful students may also receive a discount on their boating insurance from several companies.

After reading the material in the course, the reader will find a fifty question exam. Students must answer at least forty of the questions correctly in order to pass. The topics covered in the home study course include: Different types of boats, legal requirements, "rules-of-the-road," boat maintenance, aquatic safety and special topics such as trailering, weather and locks and dams. Persons who are interested in receiving the home study course materials may do so by writing to the Department of Natural Resources, Boating Safety Program, Wallace State Office Building, Des Moines, Iowa 50319-0034; telephone 515/281-6824.

An Iowa boating basics course is also taught in the classroom. Many of Iowa's schools offer this six to eight-hour course. It is basically the same as the home study course except it is taught in much more depth using training aids such as films and video tapes. This course is also taught by DNR enforcement officers, U.S. Coast Guard Auxiliary and U.S. Power Squadrons throughout the state.

The third DNR boating program offered is called the "Aquanauts Boating Safety Program." This program was developed for Iowa youths who attended various summer camps around the state. The entire program emphasizes hands-on training methods for various types of boating skills.

There are five modules offered in this program — general boating safety, motorboat safety, canoeing safety, sailing safety and waterskiing safety. Students who take these courses will actually receive hands-on training on the above subjects and

their skills will be tested on the water. This is an excellent program. You may wonder why there is so much concern about boating and water safety. In Iowa, there are almost 200,000 registered boats. There is an average of fifty to sixty boating accidents annually which usually result in about thirty personal injuries and five to ten deaths and over $120,000 in property damage.

One of the goals of Iowa's boating safety program is to reduce the number of boating and drowning accidents. All of Iowa's boating/water safety programs are fifty percent federally cost-shared with U.S. Coast Guard funds.

Snowmobile/ATV Education

Persons born after July 1, 1965 must take the DNR's snowmobile/ATV course before operating a machine in this state. This course is taught by volunteer instructors who are, for the most part, members of snowmobile clubs throughout the state. The minimum age for the course is 12. Courses are conducted throughout the state mostly November through February. The eight hours of instruction cover proper machine maintenance, safety tips, legal responsibilities, operation ethics and actual outdoor operation and evaluation. Slides and films are used to illustrate the importance of safety in operation of these types of equipment. There is a $3 fee for each student which is required by law for each safety certificate.

Depending on Iowa's snowfall, the number of students trained each year varies from 600 to 1,000. Since the program was initiated in 1977, approximately 12,000 students have been trained. Currently, there are over 55,000 snowmobile/ATVs registered in Iowa. Accident rates seem to be declining, but fluctuate greatly depending on the amount of snowfall each year. For example, let's compare 1986 with 1985 statistics. In 1986 when there was little snowfall, there were 33 snowmobile accidents resulting in two deaths — there were also 11 ATV accidents which accounted for 11 personal injuries but no fatalities. In 1985, when there was more snow, there were 62 snowmobile accidents resulting in 57 injuries and one death — reported ATV accidents totaled 19 resulting in 23 injuries and one fatality. The main reason for the snowmobile/ATV course is to reduce accidents and educate young and old alike in the proper methods of operation of these machines. The program is 100 percent funded with snowmobile/ATV registration fees.

Fur harvester Education Program

The Iowa Department of Natural Resources is embarking on its new era of natural resource management with the development of a new education program. Its purpose will be to provide a quality program of instruction and training in fur harvester education for Iowans. Course content will include instruction in knowledge of furbearers and their habits, fur harvester ethics and responsibilities, proper pelt preparation, laws and wildlife management. Persons who successfully complete the course will not be expected to be expert fur harvesters, but will be expected to have a better understanding of the responsibilities that go along with fur harvesting.

Although the program will be designed for the new or less experienced fur harvester, veterans of hunting and trapping sports can be assured the materials will also be of interest to them. A committee with members representing the Department of Natural Resources, Fur Takers of America, Iowa State Coonhunters Associated, Iowa Trappers Association, and the county conservation boards are in the process of developing course materials. The materials will be available later this year.

The program will rely on volunteer instructors trained by Department of Natural Resources staff. If you are interested in becoming a volunteer instructor, please contact the DNR.

For further information on any of the courses mentioned, contact the recreation safety officer in your area or contact the Des Moines DNR office: Iowa Department of Natural Resources, Recreational Safety Program, Wallace State Office Building, Des Moines, Iowa 50319-0034; telephone 515/281-6824.

Sonny Satre is the recreational safety coordinator. He has been with the department since 1963.

Don Sievers is a conservation program coordinator located at the Springbrook Education Center. He holds a B.S. degree from Iowa State University and has been with the department since 1978.

Six regional RSOs coordinate safety education programs around the state.

Don Sievers

Happy Birthday Rathbun Hatchery!

TEN YEARS OF PROGRESS

By Dave Walljasper

The day dawned under a warm and humid overcast sky with intermittent, light rain showers dampening the June vegetation. On that day, June 11, 1977, Iowa's only warm-water intensive culture fish hatchery was to be officially dedicated. Over seven years of planning and preparation by the Iowa Conservation Commission had been realized, and dedication was finally a tangible reality.

As the 2:30 p.m. dedication approached, the crowds and dignitaries gathered to witness the event. The overcast sky lightened and the rain showers ceased. Then Governor Robert D. Ray arrived in a National Guard helicopter which landed on the service road to the rear of the hatchery. As the Centerville High School band played the national anthem, the flag raising ceremony was conducted by Corydon Boy Scout Troup #137. Fred Priewert, the director of the Iowa Conservation Commission at that time, served as the master of ceremonies. The agenda included presentations by Mr. Thomas A. Bates, chairman of the Iowa Conservation Commission; Mr. Robert Beck of the Rathbun Lake Association; Col. Richard Curl of the U.S. Army Corps of Engineers; and the ribbon cutting by Governor Ray. After the ribbon cutting, the entire hatchery facility was open for inspection with various hatchery personnel stationed throughout the facility to answer questions posed by the inquisitive public.

Rathbun — The Concept

The Rathbun site was chosen for a warm-water hatchery because of its southern location in the state which would provide the optimum growing season for warm-water fish species. In addition, the newly completed 11,000-acre Rathbun Reservoir would provide a reliable source of high-quality water, a prime requirement for intensive fish culture. The Rathbun Hatchery was designed as an intensive culture facility which utilizes high fish densities and water flows to rear fish in a confined area. This approach to warm-water culture was a departure from past warm-water operations where fish had been reared extensively in large earthen ponds. Intensive culture methods had been widely used in the past in the trout industry, but had not been readily applied to warm-water species such as channel catfish.

The Rathbun Hatchery was built at a cost of $6 million dollars with groundbreaking taking place on March 21, 1974. Construction funds came from three sources. The Iowa legislature voted $2.3 million from Iowa's general fund, the U.S. Army Corps of Engineers provided $700,000, and the sale of hunting and fishing licenses financed $3.0 million dollars. Operating expenses for the hatchery would come solely from the sales of hunting and fishing licenses. The fish hatched and reared at the facility would be stocked statewide.

The Early Years — 1977 To 1982

Once the operational glitches of the system were rectified and the hatchery personnel became accustomed to the facility, Rathbun Hatchery produced fish as expected. Manager Vernon Spykerman had his hands full as he directed the operation of a warm-water intensive culture facility which was in actuality the first in the nation to apply intensive techniques to warm-water species such as channel catfish.

In addition to the channel catfish

Ken Formanek

Rathbun fish hatchery was the first in the nation to apply intensive culture techniques to warm-water species such as channel catfish.

Ken Formanek

which was the mainstay of the production, walleye fry, largemouth bass and tiger muskie were also produced. The walleye broodstock were obtained from Rathbun Lake in early spring by several netting crews with the aid of 150-foot gill nets. After a two-week incubation period, the fry hatched from the eggs and were stocked three days later at many locations throughout the state. Up to 65 million walleye fry have been hatched in one spring season.

Tiger muskie, which are a northern pike-muskie hybrid, were first introduced to dry diet feeding in 1978 when the newly hatched fry were obtained from the Spirit Lake hatchery and transported to Rathbun. These fish adapted well to dry diets and intensive culture and grew from one-quarter inch in length in early May to a six-inch stocking size by late July. The tiger muskie is considered a trophy fish, and up to 66,000 fingerlings have been produced annually for stocking in selected Iowa lakes.

Largemouth bass which were reared at Rathbun were hatched at the Fairport Hatchery and reared to one-inch in earthen ponds before being transported to Rathbun. Problems associated with training young bass to accept dry diets and their cannibal nature of preying upon one another diminished success of the program; but through removal of the cannibals and introduction of new, more palatable diets, a higher success rate has been achieved. Up to 205,000 five-inch fingerling largemouth bass have been produced annually from the facility.

Channel catfish production developed well in light of disease problems encountered in the outdoor concrete rearing ponds. The high density rearing environment lends itself to disease outbreaks and periodic pond sanitation procedures are necessary in order to remove fish waste and algal growth which harbor disease organisms. Channel catfish broodstock were spawned several months early by tank confinement and water temperature manipulation for several years in order to maximize seasonal growth, but escalating fuel oil prices halted further development of the program.

Recent Times — 1983 To Present

As hatchery personnel became more experienced with the facility and intensive rearing of different fish species, overall efficiency increased remarkably. Many small yet highly beneficial improvements were made to the facility to reduce manpower and increase production. A fish weighing trailer and improved pond harvest methods allow channel catfish to be harvested from the ponds with as little as four people, whereas as many as seven people were required to effectively handle the job in previous years.

Within the past two years, the intensive culture of walleye on a dry diet has been successfully implemented at Rathbun. Walleye were hatched at Rathbun, placed in earthen ponds for six weeks, harvested, and then placed in concrete rearing tanks where they were fed a cool-water diet. These walleye were reared up to a six-inch size for stocking in September. This method provides for much higher reliability for walleye fingerling survival than the extensive pond culture methods used in the past.

Despite advancements and increased efficiencies, there are the ever-present obstacles for further improvement as can be found in any operation. In 1981, a research biologist position was established at Rathbun to investigate various issues not only at Rathbun but also at the other six state hatcheries. Some of the issues that have been addressed specifically at Rathbun include a vaccination to protect young catfish from bacterial diseases, a broodstock branding program for channel catfish to identify desired spawners, and a method by which walleye semen can be preserved and used later in the walleye spawning season when the quantities of males are limited.

A summary of the cumulative totals of various fish species produced at Rathbun follows:

Channel catfish — 2″	1,686,173
Channel catfish — 6″	3,711,031
Largemouth bass — 5″	711,192
Tiger muskie — 2″	17,605
Tiger muskie — 6″	357,750
Walleye fry	438,541,000
Walleye — 5″	27,904

The Second Ten Years — What's In Store?

As Rathbun Hatchery faces its second decade of production, many new horizons are being investigated to further utilize the facility to its maximum potential. Water quality from Lake Rathbun has decreased as the lake ages; subsequently, the detrimental environmental factors influencing hatchery fish have increased. With diminished water quality and lowered dissolved oxygen levels, the incidences of disease outbreaks become more frequent. In addition, the historical high lake levels have caused problems in acquisition of sufficiently warm water for maximum growth potential and feed conversion for the channel catfish.

Equipment to upgrade the dissolved oxygen levels and reduce the nitrogen gas saturation in the supply water are being evaluated and preliminary tests are being conducted in 1987. A plan to provide a higher intake level in Lake Rathbun in order to withdraw warmer surface water is also being discussed with the Army Corps of Engineers. These and other changes would increase overall hatchery efficiencies and lower the costs of fish produced at the hatchery.

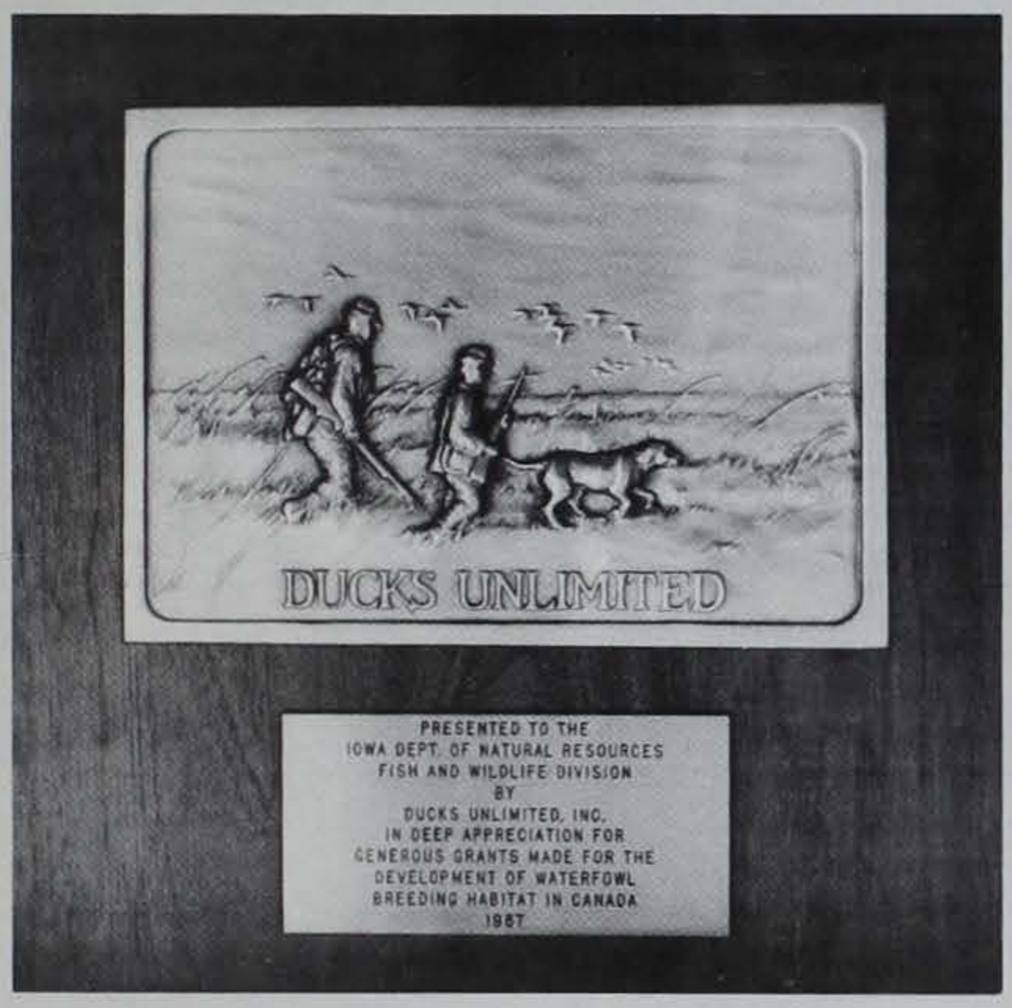
The Rathbun Fish Hatchery has been a monument to fish culture in the state of Iowa from its beginnings a decade ago. Fish culturists in other state agencies have used the intensive culture methods employed at Rathbun as they have renovated and built new hatcheries in their respective states. The hatchery has produced a vast quantity of fish for stocking in Iowa lakes and will continue to do so in the future. Iowa anglers and outdoorsmen can be proud of the facility as it is one of the finest in the country.

Dave Walljasper is a fisheries biologist stationed at Rathbun Fish Hatchery. He holds a B.S. degree in fisheries and wildlife biology from Iowa State University. He has been with the Iowa DNR since 1978.

Ron Johnson

The intensive culture of walleye on a dry diet has been successfully implemented at Rathbun.

Conservation Update



Each year 15 percent of Iowa's state duck stamp money is donated to Ducks Unlimited for acquisition and restoration of vital nesting habitat in Canada. Last year the donation amounted to approximately $35,000.

1987 STATE PARK FEES STAY AT SAME RATE

Confused over recent actions by the legislature, visitors to state parks are reminded by the Department of Natural Resources that state park entrance fees for 1987 remain unchanged for the calendar year.

Doyle Adams, state parks bureau chief, said he has been disappointing dozens of callers who think that the fees have been reduced this year. "A bill has been passed which calls for changing the fees beginning in January 1, 1988, but our 1987 rates remain intact," said Adams.

Adams said that free park permits are still available this year for Iowa residents over 65 years old, persons on Medicaid or receiving food stamps, and for those who meet Department of Transportation requirements for handicapped licenses or rear-view mirror tags. Free permits can only be acquired with proof of those exemptions at county recorders' offices.

Otherwise, permit costs of $10 for an annual permit, or $2 for a daily permit are still in effect for 1987. Adams said the recent bill passed by the legislature, among other things, calls for an annual fee of $5.50 or a daily permit for $2, but eliminates free park permits. If signed by the Governor, that law would not take affect until next year.

High-Quality Prairie Purchased

Steele Prairie, the largest remaining privately owned tallgrass black soil prairie in Iowa has recently been optioned for permanent protection by the Department of Natural Resources in a cost-share agreement with The Nature Conservancy.

According to Daryl Howell, chief of the DNR's preserves and ecological services bureau, the 200-acre prairie located in Cherokee County, is an outstanding example of this once abundant ecosystem. Less than one-tenth of one percent of the original black soil prairies remain, mostly as tiny remnants along railroad rights-of-way or in a few cemeteries or preserves. "Steele Prairie has been ranked by our scientists as a high-quality site when compared to other prairie remnants in the state," said Howell.

With a part of its share of the state lottery, the DNR will be able to contribute 50 percent of the $180,000 purchase price of Steele Prairie. The Iowa Chapter of The Nature Conservancy is seeking funds from private individuals and companies to reach its 50 percent commitment.

"Steele Prairie owes its survival to the careful management and protection efforts of the Steele family," said Howell. "Successive generations of Steeles have managed the acreage by occasionally haying and burning it since 1880. Considering its high potential value for row crops, the dogged determination of each successive generation not to plow the acreage has been remarkable."

According to Howell, Steele Prairie was first identified in the 1940s by Dr. Ada Hayden, a farsighted Iowa State University professor responsible for Iowa's early prairie preservation efforts.

Tentative plans are being made to dedicate Steele Prairie as a state preserve during Prairie Heritage Week in September.

Management of Steele Prairie will involve the cooperative efforts of the DNR, The Nature Conservancy and Cherokee County Conservation Board.

IOWA'S BLUEBIRD CONFERENCE

On August 29, the DNR's nongame program, in cooperation with the city of Marshalltown, will host the second annual bluebird conference. This conference will be an opportunity for bluebirders from across the state to gather together.

There will be a poster session where all individuals attending the event are invited to bring a map and photos of their bluebird trails. People can "tour" each other's trail and learn about special features that have added to the success of each. There will also be a variety of papers and slide shows. Topics will range from new designs in boxes and predator control to bluebird populations in Iowa. This will also be an opportunity for individuals to turn in their 1987 nest box record forms.

The conference will be held in the Fischer Community Center in Marshalltown. The center is on Highway 14 north of Highway 30 (across the road from Hardees). Registration will be held from 8:00 to 9:00 a.m. The conference will run from 9:00 a.m. to 3:00 p.m.

SHORT-EARED OWLS RELEASED

Two short-eared owls, an endangered species in Iowa, having recovered form injuries received last winter, were released in early April about three miles northeast of Ames. One of the owls had been found at the release site unable to fly nearly five months ago, and the other was turned in for treatment from Cold Springs State Park near Lewis in southwestern Iowa.

The owls were treated by Iowa State University veterinarians at their special Wildlife Care Clinic on campus, then nurtured back to health at the State Department of Natural Resources' rehabilitation facility south of Boone.

Once a common bird in Iowa, the short-eared owl needs ample prairie habitat to survive. With the disappearance of the Iowa prairie, the only short-eared owls Iowans get a chance to see in the state are those which occasionally migrate through in the winter. Only one or two known nestings have occurred in Iowa, according to biologists of the DNR.

One of the owls had hit a fence and badly damaged the muscles of its wings; the other was suffering from a dislocated elbow.

The rehabilitation of these and other wild animals is made possible by private contributions to the Chickadee Checkoff, the Veterinary Medical Endowment Fund and the Iowa Wildlife Rehabilitators Association.

Wild Otters Find Iowa Home

Last month the Iowa Department of Natural Resources relocated 40 wild river otters from the moss-festooned bayous of Louisiana to two sites along Iowa waterways.

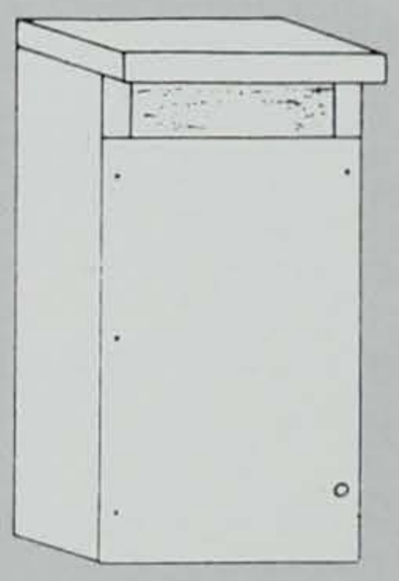
According to Ron Andrews, furbearer resource specialist for the Department of Natural Resources, ten male and ten female otters were given their freedom on Tuesday at the Rathbun Reservoir near Russell. An additional ten pairs were released on Wednesday along northwest Iowa's Little Sioux River near Peterson.

This has been the third year in a row that the DNR has staged springtime otter stockings in an effort to restore a wild population of the animals to Iowa wetlands. A total of 116 otters have now been released at six locations across the state.

Over the past two years, DNR officials have been greatly encouraged by the extremely high survival of previously stocked otters. According to Andrews, only six otters are known to have been killed from a variety of causes that

New Bluebird Boxes

The summer issue of the Wildlife Society Bulletin published some interesting results of a bluebird nest box study conducted in Kentucky. The researchers compared bluebird use of nest boxes with a traditional circular opening, a front slot opening and a top slot opening. Bluebirds preferred the front slot boxes. They built more nests, laid more eggs and raised more young in the front slot boxes than in any of the other boxes. In fact, in 1985, 91 percent of the 44 front slot boxes were used at least once by bluebirds for nesting, and 71 percent of the boxes produced at least one bluebird.



So what do these boxes look like? They are a standard square box, with inside dimensions of approximately 5x5x10 inches. Instead of a hole in the front of the box, they left a gap with the front board just below the roof. This creates a "slot" across the front of the box. For those with limited carpentry tools, it means no need for a drill bit to make the front hole.

With circular holes, there has been much research on how to exclude starlings from the nest boxes with small openings. Starlings would use the front slot opening boxes. Thus, they tested different slot sizes for excluding the starlings from these boxes. It seems that having a 1-3/16 inch gap is small enough to exclude starlings.

range from a traffic mortality to accidental trapping. He added that this level of survivability was beyond our (DNR's) wildest expectations. Numerous public sightings as well as an abundance of otter sign at previous release sites further lead biologists to feel optimistic over the animal's chances of staging a successful recovery in the state.

However, Iowa's otter restoration attempts very nearly received its first major setback this spring when an outbreak of distemper swept through the Bayou Otter Farm at Theriot, Louisiana. The farm is the source for Iowa otters and the disease outbreak killed some 125 animals being held there.

According to otter farm operator Lee Roy Sevin, this represents the first problem with the disease in the 20 years that the business has been open. Sevin buys live-trapped otters from trappers and then holds them for sale to zoos and other institutions. In more recent years, he has supplied animals to states such as Iowa which are attempting to restore otter populations.

Although the otters recently released are survivors of that epidemic, they pose no potential disease threat to Iowa wildlife or livestock said Andrews.

Iowa's otter restoration is taking place due to a three-way trade involving Iowa, Kentucky and Louisiana. Iowa has sent two wild-trapped turkeys to Kentucky for each otter received from Louisiana. Kentucky has paid around $400 for each otter coming to Iowa for a total of $464,000.

DONATIONS

Geneva Burger Adel	$250 for playground equipment at Springbrook State Park in honor of Isabell Parker
Harold Steinfeldt Eldora	$75 swingset to Pine Lake State Park
Pine Lake Lumber and Construction Eldora	Use of dozer and operator for construction of boat ramp on Iowa River, valued at $70
LeRoy Schoenthal Lake View	125 tons of fieldstone for shoreline stabilization at Black Hawk State Park
Young Museum Bellevue	$150 of Indian artifacts for the interpretive center at Bellevue State Park
Chris Garland Bellevue	$100 display case for the interpretive center at Bellevue State Park
Roeder Bros., Inc. Bellevue	Use of tractor and corn planter for wildlife management, valued at $75
Dell Pooler Bellevue	Use of cultivator, tractor and seed corn for wildlife management, valued at $155
Frank Construction and Fertilizers Bellevue	Nitrogen, phosphate and potash for wildlife management, valued at $56
Claude Peterson Stanton	Flower boxes and assorted flowers for Bellevue State Park, valued at $100
Updike Electric and Appliance Red Oak	40 washer tubs for fireplace construction at Viking Lake State Park
Clyde Smalley Madrid	Use of two hay racks for Ledges State Park special event, valued at $50
Brighton Lockers Brighton	100 lbs. of suet for bird feeding at Lake Darling State Park
Kermit Kew Clear Lake	Snow removal at Clear Lake State Park, valued at $700
Indianola Building Center, Inc. Indianola	Step ladder and tools for Lake Ahquabi State Park worth $165
Cargill, Inc. Grinnell	$1,250 worth of seed corn for wildlife management
Mrs. Nita Barnes Oskaloosa	$475 worth of materials for maintenance at Lake Keomah State Park
Roger Leuthold Marshalltown	$475 worth of athletic and playground equipment for Rock Creek State Park
Anonymous	8 hours use of telescope valued at $2,000 at Rock Creek State Park
Carroll Davis Des Moines	60 hours of generator use for sea wall construction at Rock Creek State Park
Rudy Pruszko Dubuque	Speleological Consulting and Instruction for E. B. Lyons Nature Center, valued at $735
Jerry Eiben Dubuque	$100 worth of grey fox taxidermy for E. B. Lyons Nature Center
Cindy Thurston Dubuque	Reptile display case for E. B. Lyons Nature Center, valued at $60
D. L. Stevens Maquoketa	Use of tractor and boom for lodge restoration at Maquoketa Caves State Park
Herb Lange Hazel Green, Wisconsin	384 slides for E. B. Lyons Nature Center, valued at $212
Joe Rauch Muscatine	Five rolls of wire for Rock Creek State Park
Davis Mobil Newton	$50 worth of car rims for fireplace construction at Rock Creek State Park
First Congregational Church Dubuque	$50 for interpretive program development for E. B. Lyons Nature Center
Gerda Hartman Dubuque	$75 worth of books for interpretive program at E. B. Lyons Nature Center
Interstate Power Company Dubuque	$70 worth of wood chips for trail maintenance at E. B. Lyons Nature Center

Classroom Corner

By Robert P. Rye

Animal Movement

Animals large and small move to feed, hide or find others of their own kind. Often an animal can be identified or an entire story can be told by watching it move. Movement differences are related to where the animal lives, what it feeds on and what feeds on it.

Match the animals with the movement description:

Movement	Animal
1. Which animal moves by a suction disk at each end of its body?	A. Crayfish
2. Which animal moves forward with 10 legs and rapidly backwards with a tail (telson)?	B. Butterfly
3. Which animal moves without legs yet slides smoothly and swiftly through water and over land?	C. Clam
4. Which animal moves by wings or six legs?	D. Flying Squirrel
5. Which animal moves by eight legs, can spin a webbing and float through the air?	E. Frog
6. Which animal moves on four legs or glides on membranes between front and back legs?	F. Spider
7. Which animal moves by short hair-like projections (cilia)?	G. Leech
8. Which animal moves by a series of contractions and extensions of its one foot in a series of short "hunching movements?"	H. Snail
9. Which animal leaves a "slime track" after it passes by?	I. Snake
10. Which animal moves by jumping a part of its life and swimming at other times?	J. Parameciun

Answers:

1. G 2. A 3. I 4. B 5. F 6. D 7. J 8. C 9. H 10. E

Nature Tale for Kids

Spar, the University Kestrel

By Dean M. Roosa

There is, in Sleepy Hollow, an ancient soft maple tree that spreads its glorious limbs across the small river that flows the length of the valley. This old tree, when much younger, had seen the first settlers' wagons lumber across the prairie and into its shade to camp. It had seen the last bison in central Iowa ruthlessly shot for no good reason and replaced by domestic cattle. It had seen the first barbed wire, the first cabin, the first Model T — in short, it has been a living history book, unable to tell its story. As the tree grew older and stretched its limbs skyward, lightning storms took their toll, and some limbs became lifeless. This increased the usefulness of the old tree and family after family of squirrels, flying squirrels, raccoons, woodpeckers and screech owls at some time called the old tree home. The tree was a legend and a landmark to all the citizens, human or otherwise, in Sleepy Hollow.

Not too many years ago, a pair of American kestrels, sometimes called sparrow hawks, found a cavity in one of the dead limbs a wonderful place to raise a family. The grassy fields close by afforded an abundance of mice, there were no pesky humans or great-horned owls close, and the breeze that usually blew up the valley made falcons' flights graceful beyond words. Raising the four youngsters was mostly uneventful and early June found stubby-tailed young falcons perched near the cavity entrance. A young male kestrel provided the only excitement by tumbling to the ground on his first attempted flight. Unable to regain flight, he was soon seen by two youngsters from a farm on the edge of the valley. They captured the scared little falcon and took him to their home. The youngsters quickly named the little kestrel Spar, short for part of its Latin name. After two days in captivity, the youngsters' father convinced them it would be best to return the kestrel to the ancient soft maple. Released, Spar was immediately claimed by two anxious parents. All was well again in Sleepy Hollow.

One by one the young kestrels, now proficient hunters, left the valley. Early September found them migrating southward, perched along roads on powerlines from which they could watch for movement in the grassy ditches. Spar migrated southwestward and took up winter residence in the grass- covered loess hills of southwest Iowa. Here he spent the winter in a valley where he could perch comfortably in the sun on even the coldest days.

Mid-March found him reversing his fall route, migrating back to Sleepy Hollow in central Iowa. As he entered the hollow, he got the shock of his young life. Flying toward the ancient maple, he was met by an angry kestrel who drove him from the valley. This aggressive kestrel was his father, but kinship means nothing in the animal world, and Spar took his bruised ego and flew away from the friendly confines of his youth. He wandered down the valley and onto the campus of a large university. Here he instinctively perched on the highest branches of the trees, watching for a prospective mate to pass by. When good cavities are not available, kestrels occasionally will nest in crevices of buildings. The well-kept campus provided no trees with cavities, so Spar and his new-found mate located a suitable hole in the corner of the roof of the tallest building on campus.

Spar, raised in a remote valley where he saw humans only during his brief capture, now perched in a tree and watched 5,000 students pass each day. He soon got accustomed to this and became a hit on campus. Early campus visitors would often see Spar hunting on the short-mown grassy campus. Usually, he would give up in disgust and fly to a nearby shrubby, neglected area to hunt. He got his picture in the campus newspaper when a journalism student put his new telephoto lens to good use. The real excitement came when one of Spar's youngsters tumbled to the ground in the middle of the campus. A dozen or more curious students crowded around; finally someone got up the courage to pick up the scared youngster and take it to the ornithology instructor. After checking it for broken bones, the instructor gave the same advice as that given concerning Spar — take it back as close to its nest as possible and release it. This was done, but not until a photograph was taken. Not only Spar, but also his youngster was featured in the campus newspaper. For the next four years, the kestrel family was a part of campus life. The newspaper would announce their arrival in early April and the antics of the youngsters as they learned to hunt and fly around the academic setting.

The only tragic part of their campus life was when the groundskeepers repaired the building and closed the nest cavity by nailing a board across the opening. Both falcons swooped back and forth by the building and their "killy, killy, killy" calls could be heard across the campus. By

the time concerned students got the crew to open the cavity, it was too late; the eggs had become too chilled, and that year no young falcons graced the grounds and entertained students.

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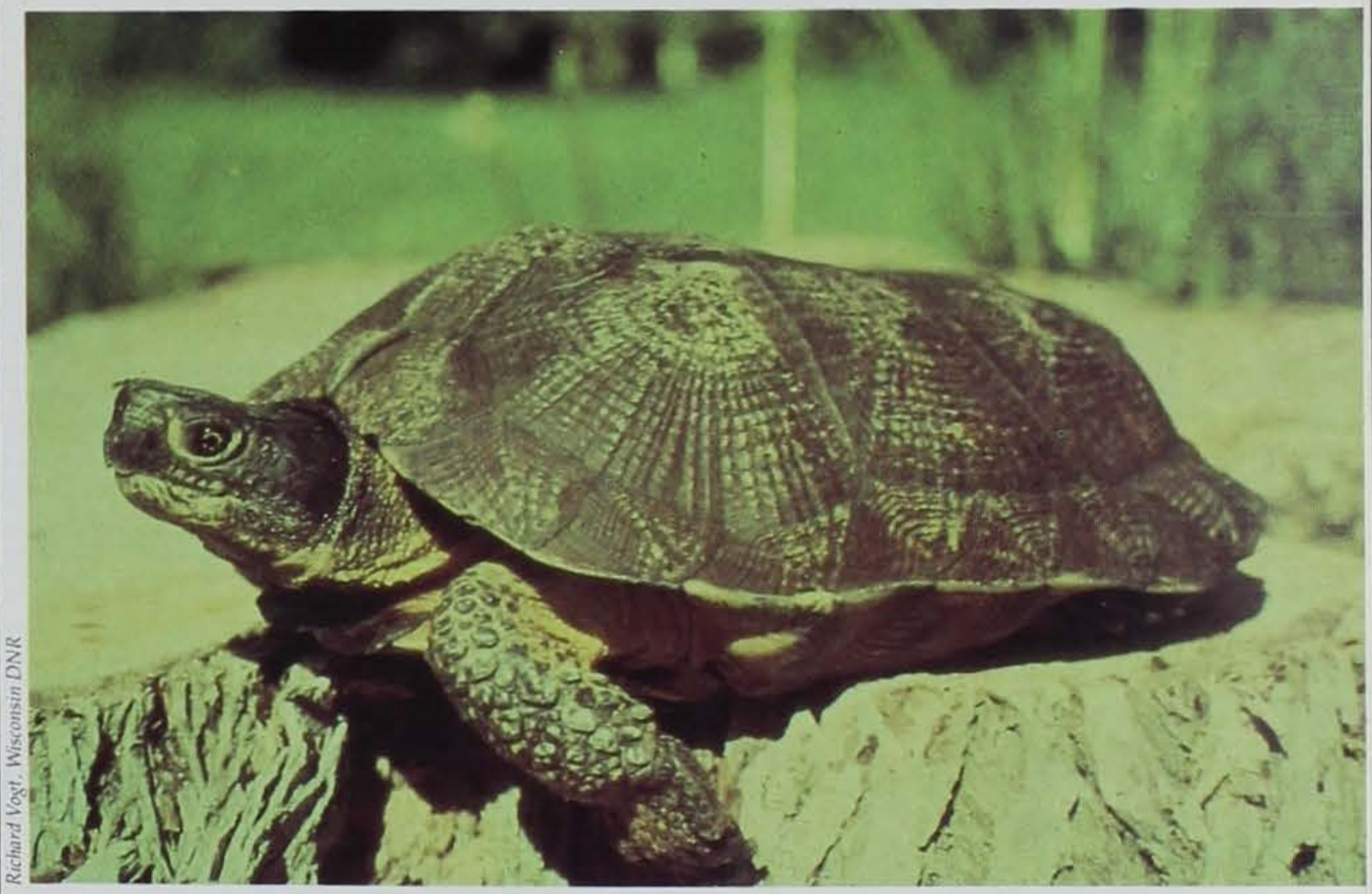
PROFILE OF
An Endangered Species



Richard Vogt, Wisconsin DNR

WOOD TURTLE (*Clemmys insculpta*)

By Dean M. Roosa

One of our most attractive and rarest turtles is the wood turtle (*clemmys insculpta*). A part of its scientific name comes from each scute or plate on its shell, being heavily sculpted in a series of concentric grooves and ridges forming an irregular pyramid. It is small, with adults averaging a shell length of five and a half to seven inches. Next to the box turtle, it is Iowa's most terrestrial turtle. It hibernates in water, but is often found wandering far afield — through woods and across agricultural lands.

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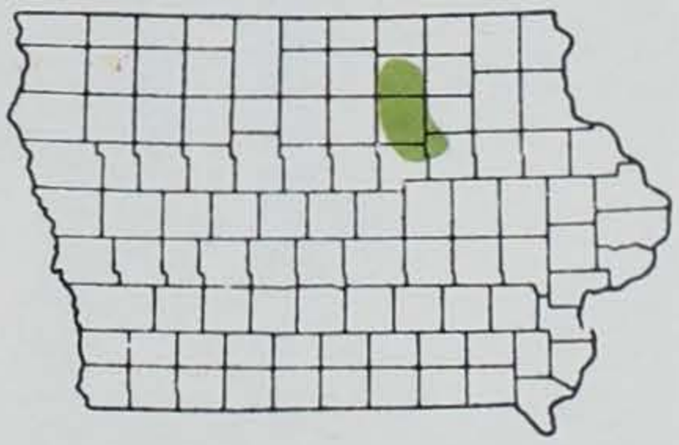

Nature Tale for Kids

Spar, the University Kestrel

By Dean M. Roosa

There is, in Sleepy Hollow, an ancient soft maple tree that spreads its glorious limbs across the small river that flows the length of the valley. This old tree, when much younger, had seen the first settlers' wagons lumber across the prairie and into its shade to camp. It had seen the last bison in central Iowa ruthlessly shot for no good reason and replaced by domestic cattle. It had seen the first barbed wire, the first cabin, the first Model T — in short, it has been a living history book, unable to tell its story. As the tree grew older and stretched its limbs skyward, lightning storms took their toll, and some limbs became lifeless. This increased the usefulness of the old tree and family after family of squirrels, flying squirrels, raccoons, woodpeckers and screech owls at some time called the old tree home. The tree was a legend and a landmark to all the citizens, human or otherwise, in Sleepy Hollow.

Not too many years ago, a pair of American kestrels, sometimes called sparrow hawks, found a cavity in one of the dead limbs a wonderful place to raise a family. The grassy fields close by afforded an abundance of mice, there were no pesky humans or great-horned owls close, and the breeze that usually blew up the valley made falcons' flights graceful beyond words. Raising the four youngsters was mostly uneventful and early June found stubby-tailed young falcons perched near the cavity entrance. A young male kestrel provided the only excitement by tumbling to the ground on his first attempted flight. Unable to regain flight, he was soon seen by two youngsters from a farm on the edge of the valley. They captured the scared little falcon and took him to their home. The youngsters quickly named the little kestrel Spar, short for part of its Latin name. After two days in captivity, the youngsters' father convinced them it would be best to return the kestrel to the ancient soft maple. Released, Spar was immediately claimed by two anxious parents. All was well again in Sleepy Hollow.

One by one the young kestrels, now proficient hunters, left the valley. Early September found them migrating southward, perched along roads on powerlines from which they could watch for movement in the grassy ditches. Spar migrated southwestward and took up winter residence in the grass- covered loess hills of southwest Iowa. Here he spent the winter in a valley where he could perch comfortably in the sun on even the coldest days.

Mid-March found him reversing his fall route, migrating back to Sleepy Hollow in central Iowa. As he entered the hollow, he got the shock of his young life. Flying toward the ancient maple, he was met by an angry kestrel who drove him from the valley. This aggressive kestrel was his father, but kinship means nothing in the animal world, and Spar took his bruised ego and flew away from the friendly confines of his youth. He wandered down the valley and onto the campus of a large university. Here he instinctively perched on the highest branches of the trees, watching for a prospective mate to pass by. When good cavities are not available, kestrels occasionally will nest in crevices of buildings. The well-kept campus provided no trees with cavities, so Spar and his new-found mate located a suitable hole in the corner of the roof of the tallest building on campus.

Spar, raised in a remote valley where he saw humans only during his brief capture, now perched in a tree and watched 5,000 students pass each day. He soon got accustomed to this and became a hit on campus. Early campus visitors would often see Spar hunting on the short-mown grassy campus. Usually, he would give up in disgust and fly to a nearby shrubby, neglected area to hunt. He got his picture in the campus newspaper when a journalism student put his new telephoto lens to good use. The real excitement came when one of Spar's youngsters tumbled to the ground in the middle of the campus. A dozen or more curious students crowded around; finally someone got up the courage to pick up the scared youngster and take it to the ornithology instructor. After checking it for broken bones, the instructor gave the same advice as that given concerning Spar — take it back as close to its nest as possible and release it. This was done, but not until a photograph was taken. Not only Spar, but also his youngster was featured in the campus newspaper. For the next four years, the kestrel family was a part of campus life. The newspaper would announce their arrival in early April and the antics of the youngsters as they learned to hunt and fly around the academic setting.

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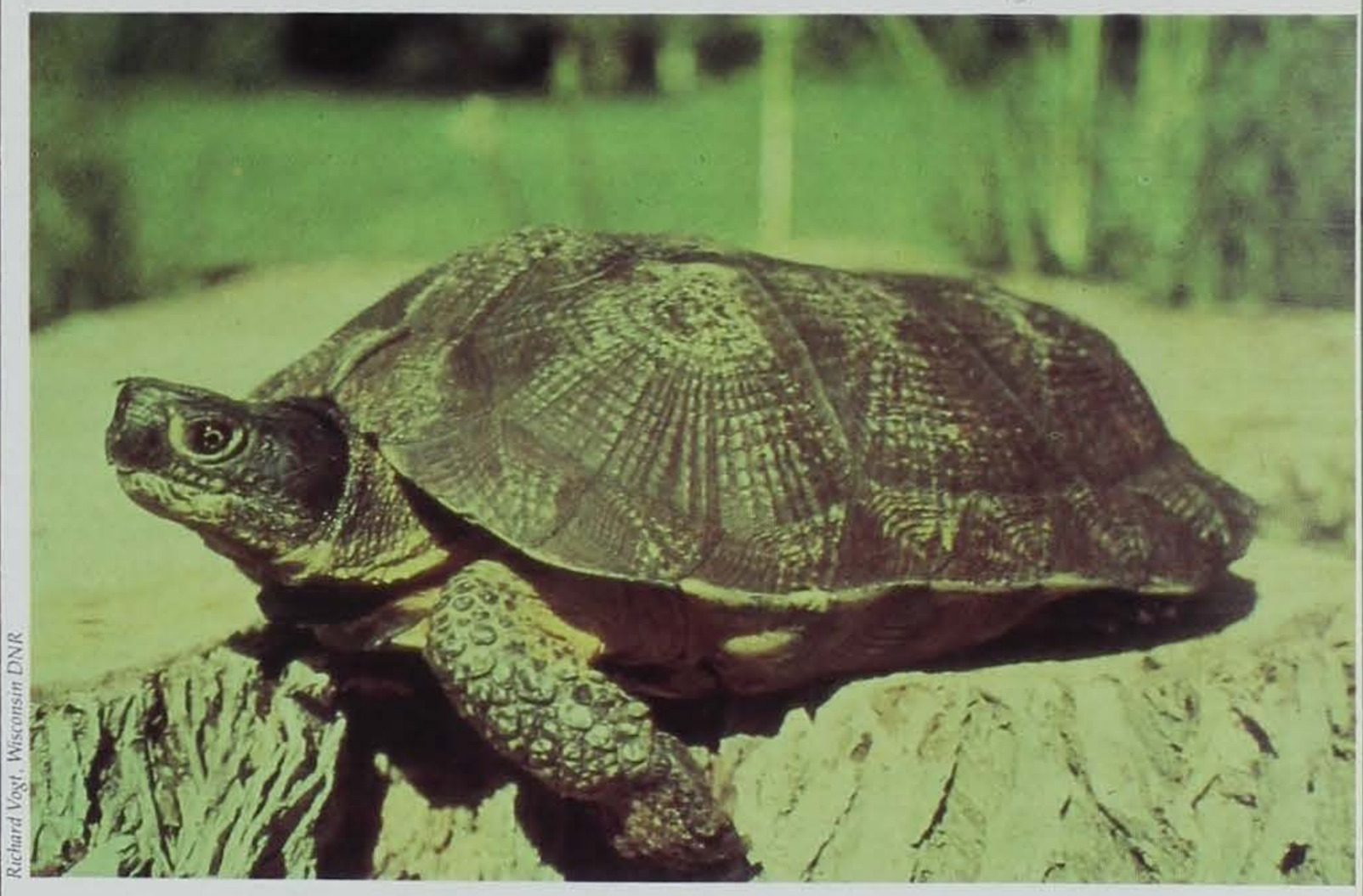

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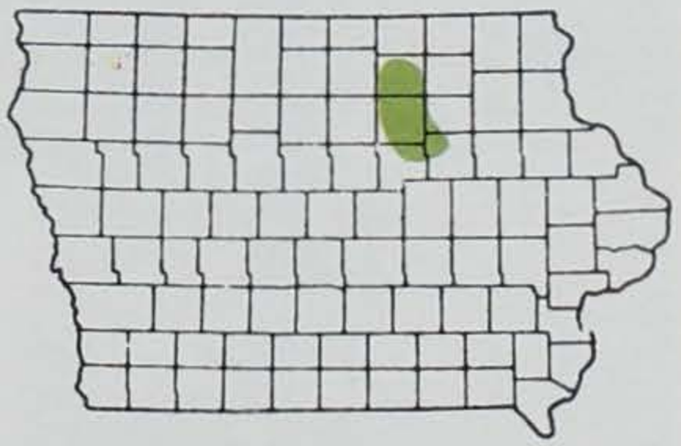


Iowa DNR photo

Generous Gifts

By Kevin Szcodronski
River Resource Planner

Brian Holt

"We want it preserved as it was when our great-grandfather owned and used it as woodlot in the 1870s."
Mervyn and Maxine Dick
Esther Dick Carlson

Paul and Helen Hindal first heard about Iowa's Protected Water Areas (PWA) program early in 1980. They instantly knew they wanted to be a part of the program and soon discussed it with Iowa Conservation Commission staff (now part of the Department of Natural Resources). Their property along the Boone River near Stratford, Iowa was a perfect setting to demonstrate their interest in maintaining a portion of Iowa's beauty to share with others now and into the future.

A lot has happened with the PWA program since January of 1980. The Hindals moved from the hustle-bustle of Des Moines to their Boone River property. The state legislature passed the PWA bill and Governor

Branstad signed it into law in 1984. The Conservation Commission in 1985 designated the Boone River from its mouth to Webster City as Iowa's first "protected water area."

The Hindals continued to patiently and enthusiastically work with Conservation Commission staff to accomplish their goal. They worked out the details of a conservation easement and, just as they always intended, donated it to the people of Iowa and specified that the Conservation Commission be the permanent caretaker of the easement. It is the first conservation easement under the PWA program and the first ever to be donated to the state. The Hindals, therefore, are truly PWA pioneers.

The Hindals' enthusiasm for the Boone River PWA has spread to their good friends Mervyn and Maxine Dick and Esther Carlson. Mervyn, Maxine and Esther also followed and supported the Boone River project since its early stages. Just like the Hindals, meetings with them and Conservation Commission staff were much more than discussions between government workers and landowners. Friendships grew, acquaintances were increasingly more casual, and partnerships developed for Boone River protection. The Dicks and Esther Carlson also donated a conservation easement.

The Hindal's influence did not quit there. Their nephew and wife, David and Ann Volkers, also own property next to the Boone River. They have also joined the partnership and donated an easement. All of these donations are very generous gifts to Iowans. They will continue to help make Iowa a good place to live and visit for years to come.

But what do these easement donations and the Boone River PWA designation really mean? How do they work to help maintain scenic beauty? Are there other ways besides easements for landowners along rivers to join in this partnership?

Conservation easements can be designed to mean and do whatever you want in regard to landowners' rights and interest in their property. Easements are legal documents attached to and recorded with property deeds. They remain with the deed as the property changes ownership, so future landowners must also adhere to the conditions. Conservation easement conditions are geared toward maintaining the natural and scenic character of the land. Examples of how they do this are: limiting the placement and number of buildings, specifying how the woodlands are managed, spelling out where livestock can graze and where cash crops such as corn, beans and lumber can be grown. Landowners can remain living on the property and use it in many ways consistent with their interests and intent of the easements. Easements do not automatically allow the public to go on the property. Whether or not general public access is allowed remains up to the landowners, and that decision can be put in the easement conditions. In fact, a well-designed conservation easement will typically have little affect on the landowner who grants it, assuming their sincere interest is maintaining the property's scenic condition. Its most important role is to assure future owners of the property have the same land ethics and continue to see to its care. Easements do have monetary value, so landowners who desire can be paid for them. If they are donated to a government agency, as a nonprofit organization, their value is tax deductible.

Easements are only one way a landowner can participate in the PWA program. Leases, property tax breaks, preserve dedications and land sales are other ways to join in the partnership of protecting Iowa's scenic water areas. The PWA program is designed to work individually with interested landowners and use whichever method best suits them and the outdoor resources to be protected.

A 25-mile portion of the Boone River is currently Iowa's only protected water area. The Iowa Department of Natural Resources hopes future funds and staff can be committed to further the Boone River project and to designate other worthy lakes, rivers and marshes.

Hats off to Paul and Helen Hindal, Mervyn and Maxine Dick, Esther Carlson, and David and Ann Volkers! May their enthusiasm and generosity continue to spread.

Ken Formanek

"Our family feels the easement is an opportunity to do something in return for the many special days we spent hunting, fishing, camping and canoeing along the Boone River. This way we can be assured that people can also enjoy the Boone River as much as we do."

David and Ann Volkers

"We each feel we are truly blessed in finding this peaceful wooded area for our home, and one way of showing our thanks is by giving a perpetual easement to preserve the Boone River Protected Water Area, one of our natural resources. We hope our enthusiasm for this project and our giving this easement will inspire others to do the same."

Paul and Helen Hindal

Ken Formanek

Ag Drainage Wells

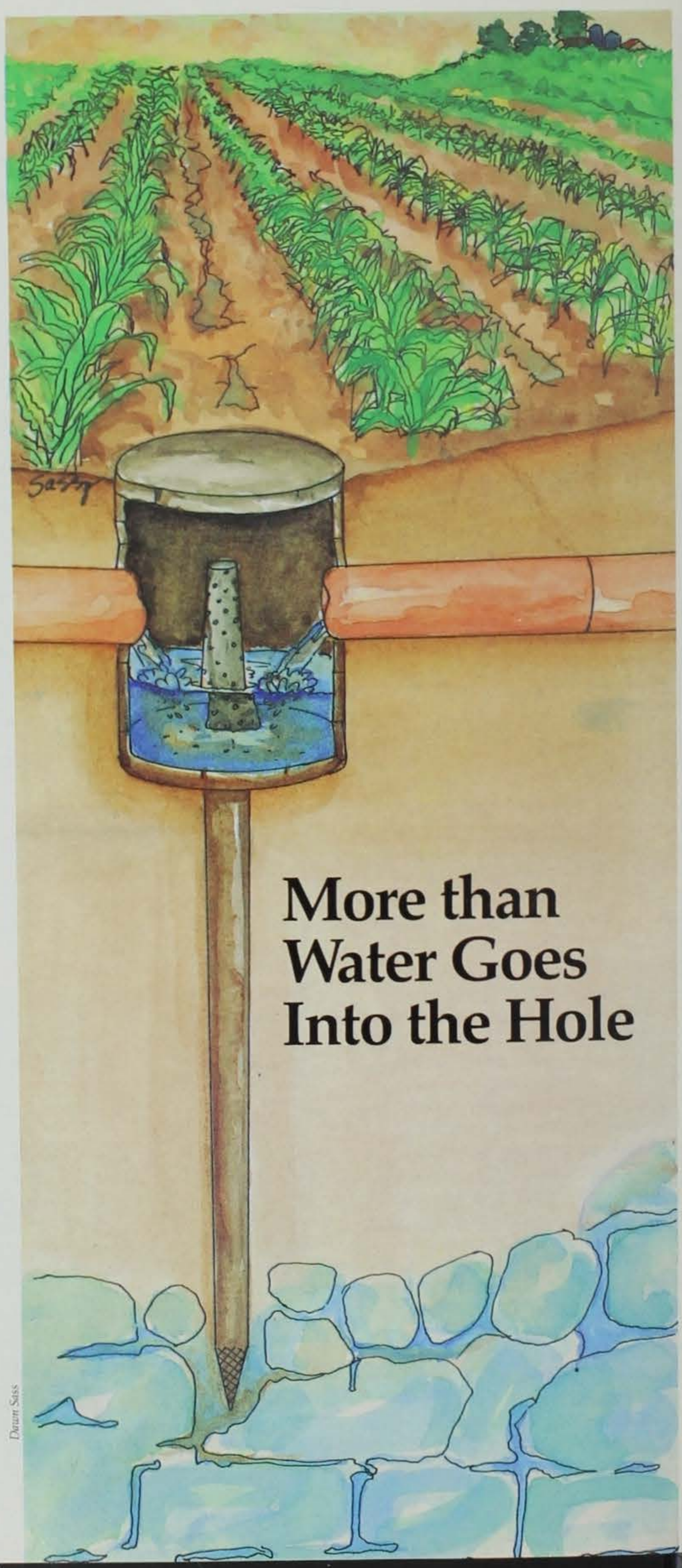
By Richard D. Kelley

At the turn of the century, north-central Iowa was a region of vast prairie dotted with numerous wetlands and an occasional farming operation. In the lower-lying areas, the land was relatively flat, soils tightly packed, and water moved slowly toward the rivers that would carry it south through Iowa and on to the sea. The sloughs and marshes scattered over the area provided habitat for a diverse and rich community of plants and animals. And, while the water lingered in these wetlands, it was cleansed — relieved of its burden of silt and pollutants.

However, in the 1800s and early 1900s, the prevailing attitude was that if man had not created the environment it was of little use. The course of hundreds of thousands of years of natural evolution resulted in an ecological balance that supposedly had no value. Wetlands were viewed as wastelands.

As early as the 1800s, efforts were begun to convert this productive marshland to agricultural land by draining the surface water. By the 1950s, this change was accomplished, at least in part, with agricultural drainage wells or ADWs.

Agricultural drainage wells are designed to remove surface and subsurface water in order to allow agricultural practices to take place on lands that would otherwise be marsh. This conversion of land through the installation of ADWs may have begun in the 1800s, but it reached a peak in the 1940s and 1950s. It is possible to use these wells to drain water because beneath the



More than Water Goes Into the Hole

Drawn Sass

soil is highly fractured carbonate bedrock formations. These formations will take water falling down the well at impressive rates of flow; up to 700 gallons per minute. These bedrock formations are also the primary source of drinking water in the region.

Generally, ADWs are constructed as underground cisterns with the well (four to ten inches in diameter) as the intake. These wells are usually located at or near the lowest point in the landscape. In addition to taking surface water, nearly all of the wells accept tile drainage from the surrounding farm fields. As a rule, the ADWs are more than 50 feet in depth and they may be drilled to over 200 feet deep.

Between 1981 and 1987, researchers from the University of Iowa, Iowa State University, the Department of Natural Resources, and the University Hygienic Laboratory conducted studies on agricultural drainage wells in Humboldt, Pocahontas, Wright and Floyd Counties. These studies identified areas of the state most likely to have drainage wells, the quality of water entering the wells, the impact the ADWs are having on the quality of drinking water and the costs of alternatives to ADWs.

Researchers have found that high concentrations of nitrate and pesticides as well as heavy loads of sediments are entering the wells. For example, in Pocahontas and Humboldt Counties, nitrate concentrations in the water falling down the wells exceeded the federal health standard of 45 mg/l in 85 percent of the samples collected. More importantly, researchers have demonstrated that ADWs are adversely influencing the quality of both groundwater and drinking water in the region.

Through detailed hydrological monitoring, it has been possible to look at water quality at various depths within the aquifer. Water quality monitoring data from numerous points above, at and below the depths at which water falling down ADWs enter the groundwater clearly shows nitrate and pesticide concentrations falling as one moves from the surface to depth. These decreased nitrate and pesticide concentrations continue until one reaches depths at which the ADWs discharge. At these depths, nitrate and pesticide concentrations suddenly increase. Natural phenomenon, such as a sinkhole, do not penetrate to this depth; thus, it cannot be used to explain the increase.

Agricultural drainage wells are also impacting the quality of drinking water in nearby water supplies. To better understand these impacts, three one-square-mile areas were studied. In the first area, researchers monitored 47 drinking water supplies. Numerous ADWs were scattered throughout the study area. In the second study area, ADWs were fewer and located toward one extreme of the site. Sixty-six drinking water supplies were monitored. Fifty- seven drinking water supplies were monitored in the third study area, and there were no ADWs. The researchers found that the mean nitrate concentration and the percent of wells exceeding the nitrate standard declined with the number of ADWs in a study area. More importantly, the nitrate concentrations and the percent of wells exceeding the standard were significantly higher in the areas with ADWs than in the area without ADWs.

Research has provided strong evidence that ADWs are contributing to the degradation of groundwater in north-central Iowa. Unfortunately, the aquifers that are being affected are also the primary sources of drinking water in the region, as well as providing recharge water to the heavily used lower formations.

The occurrence of potentially toxic or hazardous chemicals in groundwater, even in low concentrations, is of real concern because of the potential for long-term and widespread exposure to the public. A growing body of scientific knowledge strongly suggests that exposure to even low concentrations of nitrate and pesticides, over extended periods of time, may be detrimental to human health. Health concerns include not only cancer, but increased birth defects and suppression of the human immune system as well.

One possible solution to the problem of ADWs would be to close the wells and reestablish some of the state's lost wetlands. However, since most of this region's land is now tiled and drained to surface streams, the number of wetlands created by the closure of these wells will be nowhere near the number lost with the advent of drainage in the region. In a very worst case situation in Humboldt County for example, only six percent of the land would be affected if all the wells were closed and no alternative drainage was provided. Of course that situation will never arise, for alternative drainage will be provided to the majority of landowners.

For individuals whose land is drained by ADWs, closure of the wells would mean that alternative drainage would have to be installed if they wished to keep the land in crop production. Historically, ADWs have provided cheap drainage for the landowner because drainage was within the confines of the owner's property. The formation and upkeep of drainage districts, and the cost associated with those districts, were unnecessary. Closing the wells means that the water will have to be removed from the land. Engineering estimates of the cost of alternative drainage range from $90 to $320 per acre, depending on individual situations. There would also be a cost associated with maintaining this new drainage system. These costs are all new to the individual now using ADWs as a means of drainage.

Some people have suggested that the cost of providing alternative drainage in order to close ADWs is too high; however, others point out that there are also costs associated with keeping the wells in operation. These costs are not paid by the individual drainage well owner, but rather by the general public. Prior to drainage and land conversions, wetlands helped to control stream flows in Iowa. Drainage of those wetlands has resulted in increased flows in central and southern Iowa. To control the excess water, flood control projects ranging from reservoirs to floodwalls have been constructed all along Iowa's major rivers. These projects are extremely expensive to build and maintain. Additional costs also arise in the form of price supports for excess production, resulting, in part, from conversion of additional land to row crop agriculture; increased treatment cost for public water supplies;

and, the cost associated with increased adverse public health. Although some of the costs of reservoirs are offset by the recreational opportunities they provide, the costs to the public still far outweigh the costs to an individual well owner. These costs do not consider the loss of the state's natural heritage that has resulted from the changes in land use which have occurred in the region.

Agricultural drainage wells must meet the regulatory requirements of both the state of Iowa and the U.S. Environmental Protection Agency (EPA). State regulation of ADWs can generally be divided into three periods: Pre-1957, 1957-1982, 1983-present.

Prior to 1957, no regulatory requirements existed for the installation of drainage wells in Iowa. Thus, these wells became a viable alternative even in situations where natural drainage existed. Given an inability to gain an easement across adjacent property, a landowner in need of drainage right-of-way could just as easily drill an ADW as fight for that right-of-way. In many cases, wells were installed under these conditions.

In 1957, the state recognized the potential for contamination of groundwater supplies from these wells. Between 1957 and 1982, permits were required to install new drainage wells. Wells constructed prior to 1957 were generally exempted from the permitting requirements. Under the laws implemented in 1957, a new ADW could be granted a permit if it could be shown that no pollutants would be discharged to the groundwater.

In 1983, the state law was changed. Under the Code as it now reads, all drainage wells, regardless of their construction date, must be permitted. However, it is illegal to permit the discharge of any pollutant, other than heat, to Iowa's groundwater. Thus, in light of the findings of five years of research conducted on the wells, in most cases it would not be possible to issue permits on the wells without violating these rules.

Drainage wells by their nature are also injection wells, and as such are subject to regulation under that portion of the Safe Drinking Water Act dealing with underground injection control (UIC). In Iowa, the UIC program is administered by the U.S. EPA in Kansas City. UIC regulations required registration of all ADWs with the EPA by June 24, 1985. However, the ultimate fate of the ADWs under the UIC program (whether or not they will be closed) has not been decided and probably will not be until late 1987.

Richard Kelley is an environmental specialist with the DNR. He holds a B.S. degree in environmental studies from the University of Iowa. He has been with the department since 1980.

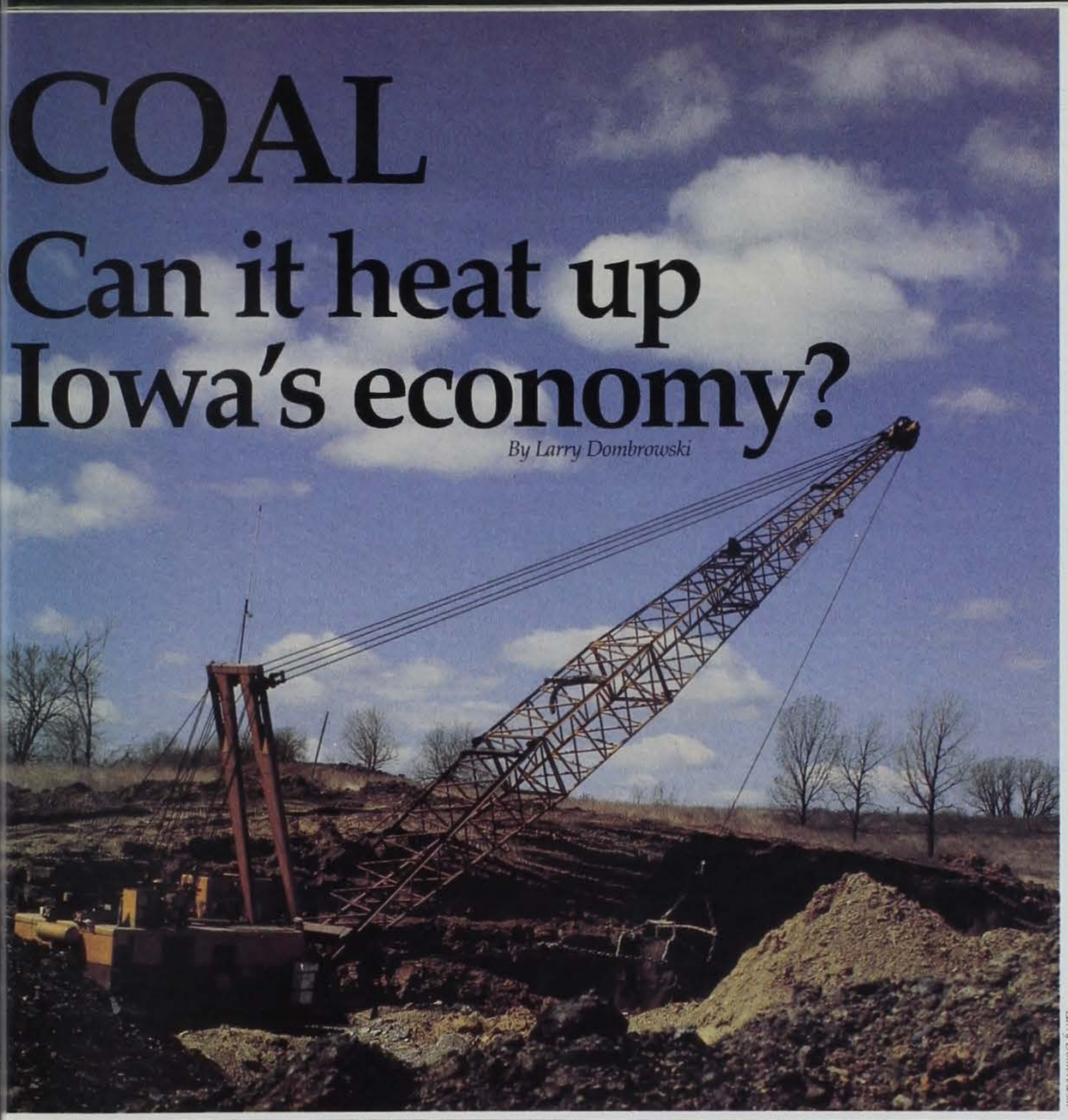
DNR Photo

DNR Photo

Exterior view of an ag drainage well **(above)** *and interior view.*

COAL
Can it heat up Iowa's economy?

By Larry Dombrowski



Larry Dombrowski

In a typical year in Monroe County, the 250 acres dedicated to coal mining generate as much revenue for the county as the 60,000 acres devoted to corn production. Unknown to most Iowans outside the three current coal producing counties — Lucas, Monroe and Marion — this abundant Iowa resource directly contributes over $14 million annually to the gross state product.

Coal plays an important role in Iowa's energy picture. Coal supplies more than 28 percent of the total energy consumed in Iowa. Over 80 percent of the electricity in Iowa is generated from coal. However, only a small fraction of Iowa's total coal needs are supplied by Iowa coal. In 1986, Iowa imported over 13 million tons of coal from such states as Illinois, Kentucky and Wyoming. Approximately 500,000 tons of coal were mined in Iowa.

Even though coal is currently mined in only three southern counties, Iowa has an estimated 2.2 billion tons of coal that is considered to be technically and economically minable. The coal reserves are located from the southwest corner of the state to the southeast corner and up through the west-central and central section of the state. Iowa coal could supply all of Iowa's coal needs for the next 150 years.

The current size of the Iowa coal industry may be relatively small, but the economic benefits to this region of the state are substantial. The four active coal companies in Iowa have over 160 employees involved in the production, processing, development, maintenance and management of mining operations. These employees earn over $3.5 million in wages. An estimated additional 100 jobs not directly involved in coal mining were

Extracting the overburden to get to the coal seam is part of the surface mining process done by Iowa coal companies such as Star Coal Company in Lovilia.

created as a result of the coal industry. Truck drivers who haul coal to customers and service jobs created by the increase in income to local economies are examples of the indirect employment effect of the Iowa coal industry.

Sales for the Iowa coal industry totaled $14 million in 1986. The overall impact on the Iowa economy is much greater than the initial $14 million in coal sales. When an industry or electric utility purchases a load of coal from an Iowa mine, the coal company must pay workers to extract and transport the coal. The coal company and the workers will then buy such items as equipment, supplies and diesel fuel from a local distributor. The coal companies will acquire the services of accountants and banks in order to financially operate. Each of the people paid to work directly or indirectly for the company — the miners, the truckers, the local hardware store, the local service station and the local bank now have incomes which are spent within the community or the region. When including all the economic activity generated by the $14 million in sales, the state's total economic gain due to the Iowa coal industry was close to $27 million in 1986.

The state also realizes noneconomic gains from the production of coal. Iowa is almost totally dependent on outside sources for its energy. Currently, coal is Iowa's only recoverable fossil fuel. The development of the Iowa coal industry will not only help the state from a revenue perspective, but will help lessen our dependence on less stable imported sources of energy.

Although a half-million tons of coal were mined in Iowa from four surface mines and one underground mine last year, the coal industry was much larger in the early 1900s. During its peak in 1917, the Iowa coal industry operated over 450 mines, had 18,000 employees, and produced nine million tons of coal. Next to agriculture, coal mining was Iowa's most profitable industry.

The downturn in Iowa coal production in recent years is attributed to greater concern for air quality and competition from areas where coal is more accessible. Strict environmental standards limit the amount of sulfur allowed to be emitted by industry and electric generating stations. The standards have deterred wide usage of Iowa coal, which is medium to high in sulphur content. Iowa coal contains approximately 1.5 to 6.0 percent sulfur. While this is comparable to most midwestern coals, it cannot match the less than one percent sulfur content of western coals. Large trainloads of low-sulfur coal from western states have displaced medium and high-sulfur coals in Iowa industries and utilities in order to meet sulfur dioxide emission standards.

Another concern with Iowa coal is its ash content. Ash content is associated with the minerals and other matter found in coal. Pyrite, quartz, calcite and clay are typically found in the coal. After the coal is burned, the ash remains and must be cleaned out and dumped at an acceptable site. Iowa coal contains a fairly high percentage of ash, ranging from six to fifteen percent.

The sulfur and ash properties of Iowa coal can be reduced by conventional coal washing techniques. The amount of ash can be decreased by 30 percent during the coal cleaning process. Although coal washing increases the price of coal, it improves the quality and the heating value of the mineral. The Iowa State Mining and Mineral Resource Research Institute is developing new pre- and post-combustion coal cleaning methods to reduce sulfur emissions. This research could lead to expanded markets for Iowa coal.

Prior to the 1970s, there were substantial abuse to land and water resources by the coal industry nationwide. In response, the federal government established the Surface Mining Control and Reclamation Act in 1977 to help protect the environment. This law mandates that coal companies must maximize soil conservation, minimize any disturbances to the hydrological balance, and protect the area from mine wastes. Coal companies must also plant vegetation which is native to the area and maintain that crop for a period of five years. To insure reclamation projects are properly carried out, bond is required to be posted for the amount of the reclamation project. In Iowa, there have been a number of successful reclamation projects showing coal can be mined with little impact to the environment and in some cases, actually improve the quality of the land. These projects are not without substantial costs. The reclamation of land represents 8 to 14 percent of the final cost of coal.

The thickness of the coal seam helps to determine the amount of coal that can be produced from a mine. The average seam thickness of Iowa coal is from three to four feet. In contrast, the Wyodak coalbed in Wyoming has an average seam thickness of about 70 feet and is more than 100 feet thick in places. Miners in Iowa are able to extract almost three tons of coal per hour per miner, whereas their Wyoming counterparts can mine nearly 15 tons per hour. Given the geological advantages of the Wyoming coalbeds, coal companies in Wyoming are able to transport their coal over 800 miles to Iowa and be price competitive with Iowa and other Midwestern coals.

Despite some of the difficulties encountered by the Iowa coal indus-

Larry Dombrowski

Farm area reclaimed after the mining operation is completed.

try, coal will continue to gain importance as a fuel source. During the next ten years, coal use in the U.S. is projected to grow faster than overall energy consumption. This expansion is projected because domestic coal reserves are abundant, domestic oil and natural gas reserves are being depleted more rapidly than coal reserves, and the price of coal will continue to be lower than the price of oil or natural gas.

The future of the Iowa coal industry appears promising with the advent and development of technologies such as fluidized bed combustion. An advantage of fluidized bed combustion is that it controls sulfur emissions at its source. The emission of sulfur dioxide released inside the fluidized bed combustor can be greatly reduced when crushed limestone is added to the fuel bed mixture. The sulfur dioxide reacts with the limestone to form a dry, solid waste product. A standard fluidized bed combustion unit burning high-sulfur coal in the presence of limestone can trap sufficient levels of sulfur dioxide to met air quality standards.

The University of Iowa, Iowa State University, and the Archer Daniels Midland Company in Cedar Rapids are currently in the process of installing fluidized bed combustors capable of burning a total of 900,000 tons of high-sulfur coal per year. These units will all be operating by 1989.

If Iowa coal companies are able to supply coal at competitive prices to these units, the Iowa coal industry has the opportunity to more than double its production within the next few years, bringing some much-needed economic relief to a depressed area of the state.

Larry Dombrowski is an economic analyst for the DNR's energy bureau. He holds a B.A. degree in business administration from the University of Iowa. He has been with the department since 1984.

The Hull Area Reclamation

By Jim Bruce

Strip mining coal had been practiced in south-central Iowa for years without any regard to restoring land to a productive condition. But, this practice was greatly curtailed by passage of the Surface Mining Control and Reclamation Act of 1977. This federal legislation and accompanying state laws now require that mined lands must be restored to a productive state, as a condition of the required mining permit. The federal legislation also imposed a tax on coal production, with the resultant funds to be used for restoration of abandoned mine lands.

Approximately three million dollars of these funds are being utilized to reclaim the Hull Wildlife Management Area. The Hull area is located four miles west of Oskaloosa and lies to the south of Highway 92. The Iowa Conservation Commission, now the Department of Natural Resources, purchased this 380-acre area in the early 1950s at a cost of approximately $16,000. Most of the area had been strip mined for coal in prior years, and much of the land supported little or no vegetative growth. A biological survey of some 20 water areas disclosed only seven "ponds" with a pH greater than five. The range of pH varied from 2.7 to 7.2. A pH of four can be considered to be acutely toxic to fish, and values somewhat higher can have long-term detrimental effect. The pH value is commonly used as a measure of acidity, with values below seven becoming more acid as you move down the scale. This acidity, which exists in both the spoil areas and water is in the form of sulfuric acid. The H_2SO_4 results from breakdown of sulfides contained in the coal seam and associated strata, when they are exposed to air, moisture and bacterial action.

There can be some recovery of these toxic spoil piles with time. This is accomplished as vegetation encroaches over the spoil and retards the decomposition, and as the sulfides are leached out. Both of these processes can be very slow due to repeated exposure of new material by erosion of the spoil material. Many years would be required for complete healing of many of these areas.

A great deal of work has and is being done at the Hull Area to shortcut this long healing process. The basic thrust of the reclamation work is to cover the acid-producing materials which have been exposed by the mining activity. To accomplish this it is first necessary to modify the landform enough to provide erosion control. On the area, numerous spoil piles and ridges have been leveled and the new landform terraced and tiled. Some 24 miles of terrace and five miles of tile will be put in place. This new surface must be covered with a nonacid-producing soil which requires a good deal of borrowing from areas which have not been mined. To meet this requirement for borrow, it has been necessary to purchase additional land adjoining the areas to be reclaimed. The new Hull Area will encompass approximately 580 acres.

To further facilitate water control and increase recreational opportunity, a number of ponds will be maintained, enlarged or created on the area. A total of nine ponds with 41 acres of water will result. Six of these ponds (38 acres) should have fishery value, with the two largest (7.7 and 22.4 acres) having considerable potential for providing angling recreation. For any of this work to be of value, it will be necessary that the restored areas are revegetated. An extensive plan has been developed for this purpose which involves liming, fertilizing and reseeding with suitable species of grasses, forbs and woody vegetation of various sorts.

All of this work should be completed within the next 12 months; and once the vegetation and fish populations become established, the area will provide considerable recreational opportunity.

Jim Bruce is a fisheries biologist located at the Rathbun Hatchery. He holds a B.S. degree in fisheries and wildlife biology from Iowa State University. He has been with the department since 1972.

Cleaning Iowa's Coal

By Richard Markuszewski

One of the major limitations of using more Midwestern coal, and especially Iowa coal, is the high sulfur content. When coal burns, the sulfur it contains changes to sulfur dioxide (SO2) and is emitted to the atmosphere. Because SO2 is hazardous to health and bad for the environment, having been indicted as a source of acid rain, strict federal regulations were put into practice in 1971 and 1979. The latest version, known as New Source Performance Standards (NSPS), requires that for large, coal-fired utility boilers constructed in 1979 or later, the total reduction of SO2 emission be 70 to 90 percent, depending on the initial content of sulfur in the coal. These reductions can be based on any combination of pre-combustion cleaning (coal preparation), post-combustion cleanup (scrubbing), or in-combustion control.

For existing boilers, emission limits can vary with location, population density and state law. In Iowa, about 2.5 to 3 percent sulfur in coal is allowed in older boilers, but only about 0.6 percent sulfur (or about four times less) in coal for NSPS boilers.

Unfortunately, Iowa coal has a high sulfur content; it can average 4 to 5 percent, therefore it cannot be used directly for combustion without breaking the SO2 emission limits. But, fortunately, the sulfur content can be reduced by coal cleaning.

In 1974, at the height of the oil embargo, the Iowa legislature appropriated funds to start the Iowa Coal Project. Its goals were to demonstrate that Iowa coal can be surface-mined in an agricultural setting in an environmentally acceptable manner; the land can be restored to equal or better productivity; and the coal can be cleaned to acceptable levels. Meeting these goals would ensure the use and value of an important natural resource of Iowa.

All of the above goals have been accomplished by Iowa State University during the course of extracting over 110,000 tons of coal. In addition, this project provided the impetus to establish the Fossil Energy Program at the Ames Laboratory which is operated by ISU under contract for the U.S. Department of Energy. It also helped create the Iowa State Mining and Mineral Resources Research Institute (ISMMRRI) to carry out education, research and training programs for the U.S. Department of the Interior.

A force of scientists, researchers and educators at ISU developed and expanded their expertise in coal science. As an added bonus, a coal preparation research plant was constructed in 1976 on the ISU campus. It is the only university-owned and operated experimental coal cleaning facility in the United States dedicated exclusively for research purposes.

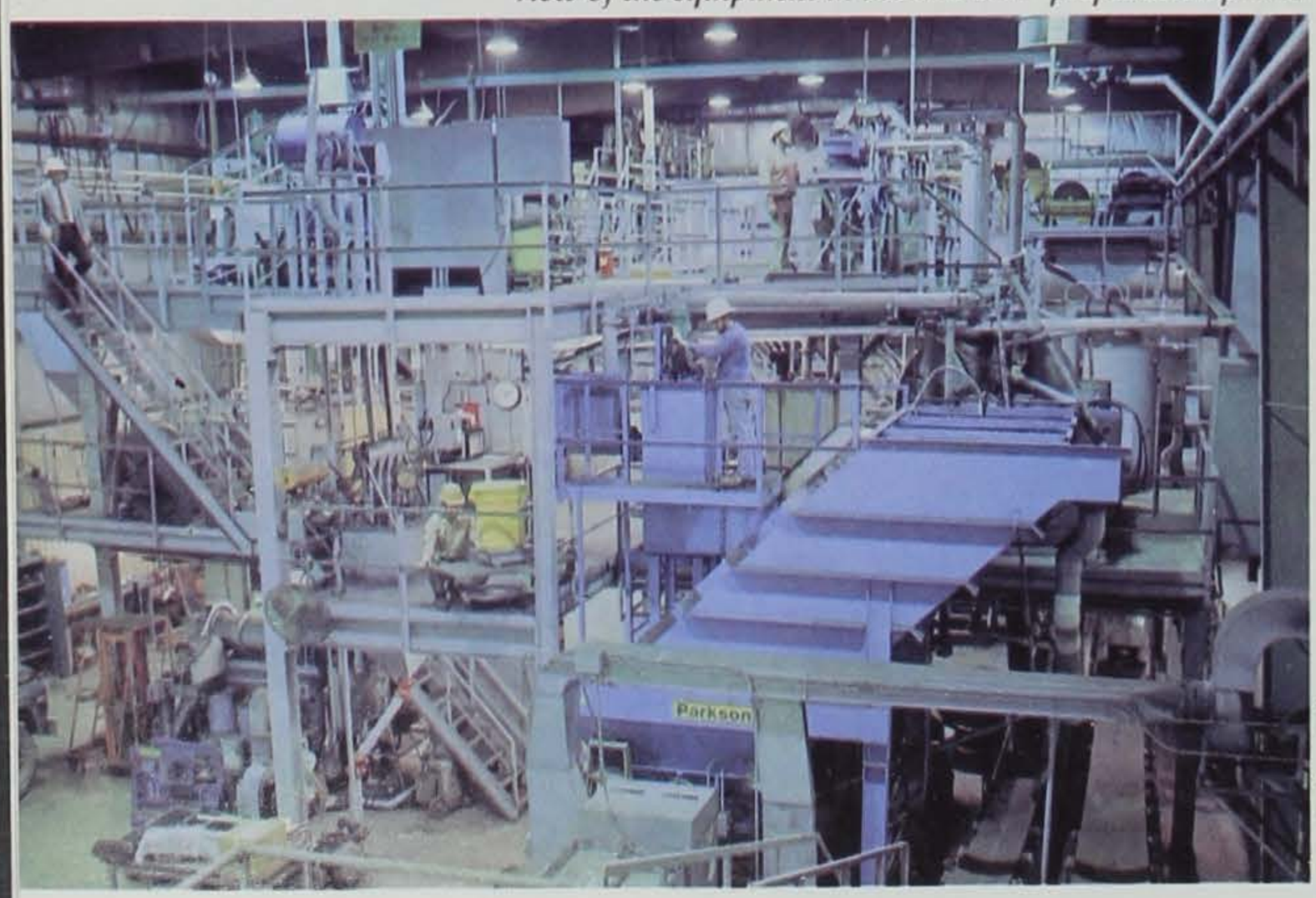
Encouraged by the research results of this plant, which showed that Iowa coal can be cleaned and marketed, three commercial coal preparation plants have been constructed in Iowa. Associated with these accomplishments were a revitalized Iowa coal mining industry, significant savings in fuel costs at ISU, establishment of an Iowa manufacturer for coal cleaning equipment, and help in promoting long-term markets for Iowa coal.

Although much has been accomplished, much more remains to be done. To help meet the much stricter NSPS requirements, additional research is being done to reduce even further the emissions of SO_2. Work is progressing on several fronts at ISU.

The major thrust is to remove sulfur and ash components from coal before it is combusted. One approach is to use several special techniques to determine the amount of foreign minerals in the coal and the size of these particles. In addition, this method can also be used to determine how thoroughly these substances are mixed with the coal. Such information helps to predict how finely a coal sample must be ground to free the mineral matter, especially pyrite, so that it can be separated before burning.

Because many of the physical separation methods depend on the differences in surface properties between the particles of coal and the mineral matter, methods are being

View of the equipment in the ISU coal preparation plant.



Dennis Saltsbury, ISU

explored to protect, enhance or modify surfaces of fine particles as they are being freed in the separation process.

One project uses oil to coat coal particles and bring them together into a large mass. The minerals within the mixture tend to remain small and are later separated by simple screening.

Still another study explores the application of ultrasonic energy to enhance the physical or chemical removal of mineral matter and sulfur from coal. Such improvement could result in significant savings in the cost of coal preparation processes. Other projects include experiments in chemical cleaning and in developing instruments to monitor the coal cleaning processes at various stages.

The efforts in cleanup are fewer after the coal is burned. One project will apply ultrasonic energy to destroy cancer-causing organic compounds which would be emitted with combustion gases.

For control of pollution during coal burning, a major effort will improve fluidized bed combustion, either by improved combustor design or by developing new fuels such as coal-limestone-water mixtures.

Other projects address the management of wastes associated with coal preparation, combustion and conversion. Processes have been developed to recover from fly ash valuable resources such as iron, aluminum and other useful metals. At the same time, methods have been explored to stabilize fly ash mixed with other wastes for safe disposal.

All these efforts are dedicated to enhance the understanding of coal, improve its use and solve the pollution problems associated with its combustion. Finding answers to these problems will help increase the use of Iowa coal, expand its markets and help to improve the economy of Iowa by improving the coal mining climate and helping create jobs.

Richard Markuszewski is the director of the Iowa State Mining and Mineral Resources Research Institute at Iowa State University. He holds a Ph.D. from ISU and has been with Iowa State University since 1976.

Acid Rain in Iowa

By Jerry Spykerman

The amount of substances dispersed in the atmosphere and deposited by precipitation is expected to continue to increase throughout North America. Therefore, there is an increasing need for careful measurement of the amounts, nature and effects of these substances in agricultural, forest and aquatic ecosystems of the United States.

The National Atmospheric Deposition Program was created in the early 1980s by the Association of State Agricultural Experiment Stations. By July, 1984 the number of stations has increased to 160. These additional stations are sponsored by the U. S. Geological Survey under the National Trends Network. Big Springs Fish Hatchery located at Elkader, Iowa is one of the stations in this network.

The precipitation to be monitored is collected on a weekly basis. The pH and conductivity is derived from the sample before it is sent to a laboratory for further analysis. At the laboratory, the sample is analyzed for pH, conductivity and nine cations and anions.

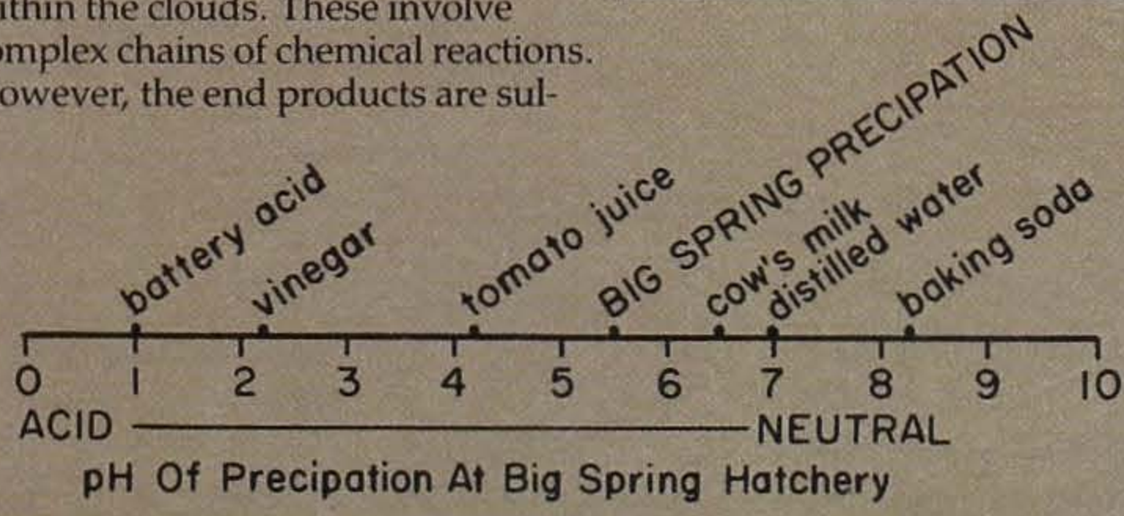
The two main anions that are tested for are NO3 and SO4. These are released into the air by electrical power generation, industrial processes, transportation, space heating and other human activities. There are also natural sources of these compounds such as forest fires and lightning. Once these anions are in the atmosphere, they can transform through a photochemical process (with energy from the sun) or through a wet chemical process within the clouds. These involve complex chains of chemical reactions. However, the end products are sulfuric and nitric acids which are the prime contributors to the acidity of precipitation whether it is rain or snowfall.

The pH value is a measure of the acidity of a solution. For instance, a solution with the pH value of three is ten times more acidic than a solution with a pH value of four, and a hundred times more acidic than a pH of five. A pH of seven is considered neutral, and a pH of nine is alkaline. Rain is defined as "acid" only when its pH is below 5.6.

From August, 1984 to December, 1986 the average pH at Big Spring Hatchery derived from the weekly precipitation samples was 5.71. The highest pH reading attained during any one week was 7.63 while the lowest reading was 4.09. It was found that there was not any difference in the pH readings from one season of the year to the next. The diagram shows how the pH of the precipitation at Big Spring compares with common solutions you are familiar with.

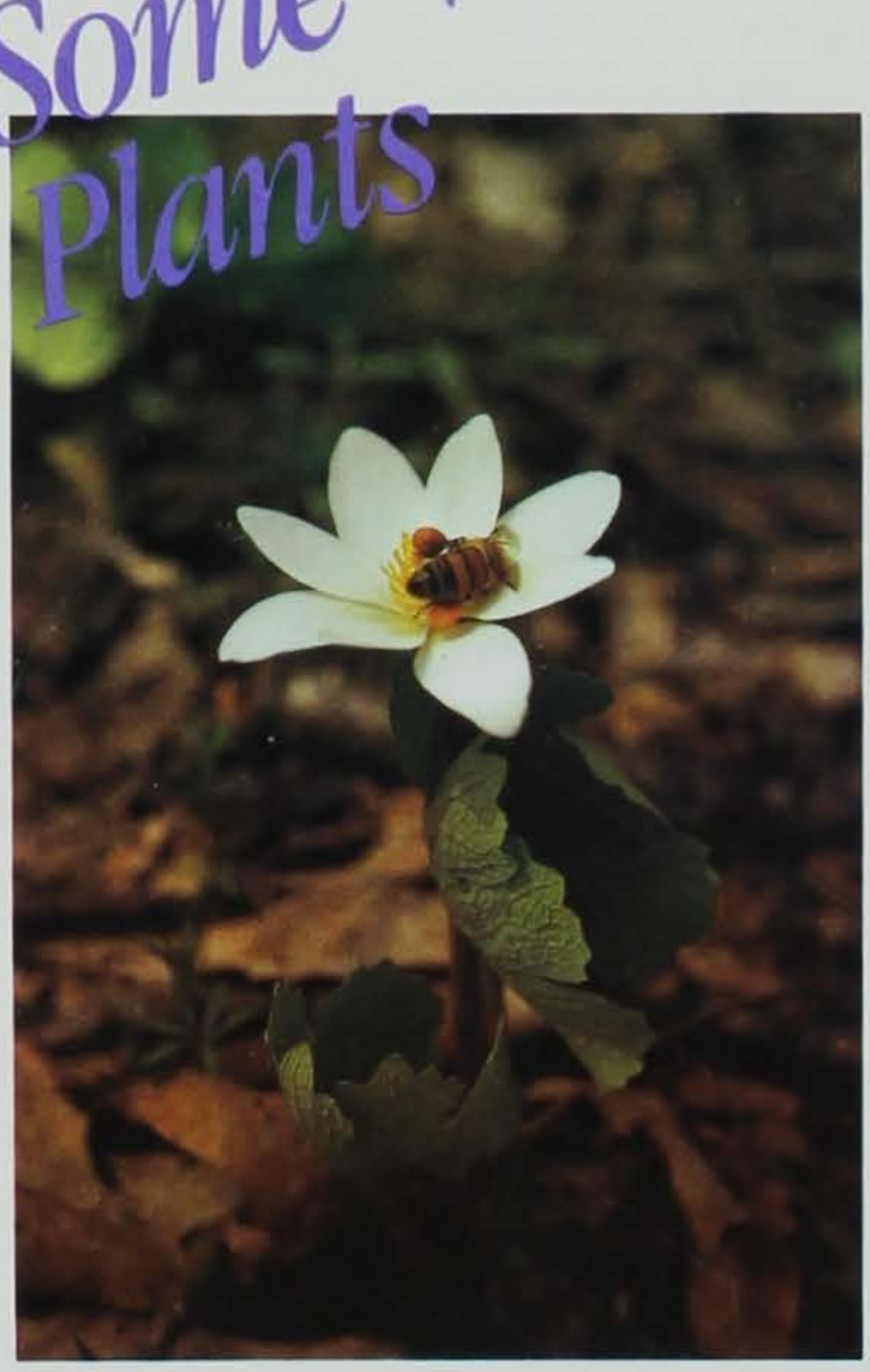
As you can see, acid rain is not a problem yet, but continuous monitoring is necessary to determine trends in our changing chemical climate. Documenting such trends enables scientists to estimate how much the emissions from areas of concentrated industry contribute to acid rain both locally and in remote areas.

Jerry Spykerman is a hatchery manager located at Big Spring Fish Hatchery in Elkader. He has a degree from Iowa State University in fisheries and wildlife biology and has been in the conservation field since 1963.



pH Of Precipation At Big Spring Hatchery

Uncommon Uses for Some Wild Plants



Ken Formanek

Bloodroot **(right)** *and hepatica* **(below).**

Roger Sparks

By Tammi Martin

The warm weather of spring and early summer brings the many plants of Iowa to life. Budding trees and blooming flowers are welcome sights throughout the state and many people enjoy watching nature spring into action. While many plants are appreciated for their beauty, and others for their usefulness, still other species have uses unknown to most people.

Plant species common to Iowa have histories of use by the early inhabitants of the state. The Indians and pioneers of frontier Iowa gathered a vast variety of plants for food, medicinal uses and many other purposes. Some well known examples come to mind immediately, like dandelion greens, wild herbs and spices and the many wild berries. The uses of these plants and many others have survived the generations and are still in practice today. However, the practical uses for many other plants have been lost to advanced technology.

Among the pioneers and Indians it was a common belief that a concoction made from a plant shaped like an organ or body part would cure a sickness in the body part it resembled. One example of this is the hepatica. As the name implies, the leaves of this plant are liver-shaped and were used to cure liver ailments. Although this belief was merely myth, the hepatica proved useful in another manner. A large amount of tannin collects in the mature leaves, and was extracted for use in tanning leather. As a source of tannin, the hepatica plant was truly invaluable to early Iowans.

Everyone appreciates the delicate beauty of wild violets, but there are several uncommon uses for these flowers. In early folk medicine eating wild violets supposedly purified the blood, while the leaves provided a natural laxative. In addition to the medicinal value, pioneers collected violets for food. They used the leaves as greens, candied the flowers and made violet jelly. Although still a common flower throughout Iowa, the variety of uses for violets are not well known.

Another plant with a history of multiple use is the bloodroot. Common names like "pain ease" and "red

Indian paint" suggest just a few uses of bloodroot. The Indians and pioneers also used bloodroot to make tonics for stomach aches or salves for burns and fungus. The red juice found in the roots was used as a dye and in Indian war paint. It was possible to make the color permanent by using the dye with the tannin found in other plants. The bloodroot was an important resource for the Indians and pioneers of Iowa.

Frontiersmen learned of valuable food sources from the Indians as they traveled west. As their supplies grew scarce and they moved farther from civilization, they learned of many substitute foods. For example, the cattail substituted for several foods. The pioneers learned to collect the pollen and use it in place of flour and the starchy meat of the roots provided a potato substitute. Before the cattails bloomed, the spikes were collected, boiled and eaten like corn on the cob. The young shoots were also gathered and eaten raw. Not only did the cattail provide a food source but the dry leaves were used to weave baskets. Almost the entire plant proved to be useful first to the Indians and then to the settlers.

Even more uncommon uses are known for some of the native prairie plants. One type called the scouring rush or horsetail was used to scrub pots and pans. The plants in this family have extensive silica deposits in their stems and the silica grit helped in the cleaning of cooking utensils. Foxtail grasses also had an unusual but important use. The Indians and settlers used this grass to keep the rats away from their grain. At maturity these grasses have long, hard bristles, and the Indians and settlers covered their grain with these dry stalks. When the rats tried to get into the grain the bristles would lodge in their fur and effectively keep them out of the grain. Although these plants were not used as food or as medicines, they were beneficial to early Iowans.

These are just a few examples of plants, native to Iowa, that have proven beneficial to man. Historically, many plants were used for medicine and food, but most of these have long been forgotten. The values of many of Iowa's plants are known only to a few people who still study folk medicine and foraging. However, perhaps knowing some of the benefits that plants have provided in the past will make you think about and appreciate the plants differently as they reappear this spring and summer.

Tammi Martin is a recent graduate of Grinnell College. She holds a B.S. degree in biology and served as an intern for the DNR's information and education bureau.

Tim Loftus

Ron Johnson

Bruce Morrison

***Cattails* (left), *violets* (below left) *and horsetail* (below).**